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TELEPHONE ENGINEER

Features — Developments of FCC Rate Inquiry . . . Priority for Telephone Manufacturers . . . Report of USITA Conference . . . Fluorescent Lighting . . . Wire Chief's Training Course . . . Line and Desk

MANAGEMENT ENGINEERING
MAINTENANCE

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This switchboard is completely self-contained; it is simple to operate; it is easy to maintain; and, above all, it has a very low cost. It is an extremely popular unit and small telephone companies planning to convert to common battery operation are urged to make early commitments to insure satisfactory delivery.

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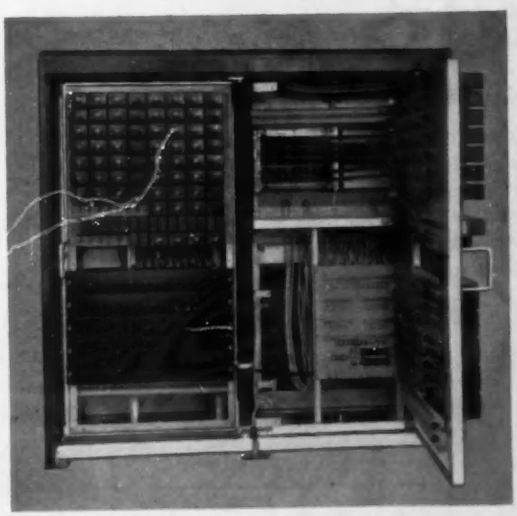

With Spring, beautiful flowers and back aches to aspiring gardeners comes another breath that made all of us here at the office realize more and more that we, in our little niche, might be doing some good. The reason: a letter from our old friend C. E. Eaby of Ephrata, Penn., who writes us a greeting and then calls attention to a new subscription enclosed to go to Private David R. Eaby, Camp Shelby, Miss. You are right! He wanted his son to have "The Wire Chief's Training Course" now running in TELEPHONE ENGINEER, and too, that he might keep in touch with the industry to which his Dad has devoted his lifetime. Are there any more sons we can serve?

Comes invites to many of the state association conventions. By the time this is read we hope to have been present at the Pennsylvania and New York meetings and to have enjoyed visits with Harry Engh, Milt Stewart, Lloyd Wright and Arch MacKinnon. As they are the president and secretary respectively of the two Associations we are going to investigate their boasts that their 1941 meetings will be all they claim them.

Two "Knights of the Crutch," Naugle Pole's president Omar C. Curtis, and Kellogg's sales representative H. H. Hogue, both of whom suffered broken knees recently, are now back in harness.

TELEPHONE ENGINEER

MANAGEMENT · ENGINEERING · MAINTENANCE

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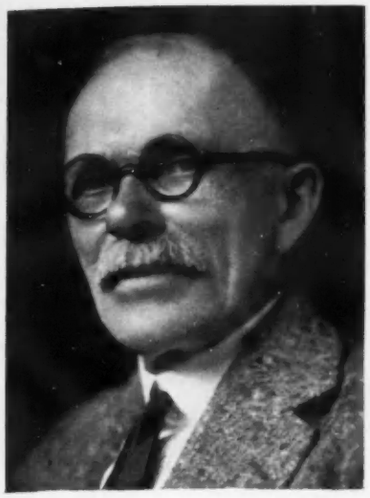

John H. Wright, Vice President.

Carl D. Brorein, President.

Clyde S. Bailey, Association Washington Representative.

Spring Executives Conference Gets "Down To Business"

By RAY W. SMITH

THE Spring Executives Conference of the United States Independent Telephone Association met on April 29 and 30 at the Stevens Hotel in Chicago. At the end of the 2-day session almost 250 executives adjourned after hearing business reports from many important committees. Keynote: Defense and toll compensation. Executive vice president Louis Pitcher was roundly applauded for the excellent program that enabled the Conference to get down to business from the first minute after the opening session.

President Carl D. Brorein, Tampa, started off the program on the keynote of Defense after greeting the Conference in behalf of the Association. As Mr. Brorein is the chairman of the Association's National Defense Co-ordinating Committee, his message was doubly important as it consisted of a report on that committee. His statement regarding the growth of the telephone industry under commercial ownership during the past 20 years coupled with the accomplishment in improvement of all phases of the art was cited by many present as the answer to the question of whether governmental control or ownership was necessary in case of emergency. He further stated that the co-operation already given the government, despite heavy commercial demands, would be continued and pledged the support of the Independents in behalf of Defense preparedness to that end. His message was further emphasized by the report of Lieut. Col. Wm. C. Henry, Bellevue, Ohio, who is on Gen. staff of the Signal Corps as liason officer representing the Independent industry, who explained in detail all arrangements that have been made as to rates and charges covering the maintenance and the rendition of service to army units.

Louis Pitcher, Executive Vice President

When Association Washington representative Clyde S. Bailey finished his report on the activities of the Washington office, the Conference had perhaps its most comprehensive report it had heard in many years on that subject. From his address the entire assemblage heard first hand of the multitudinous activities necessary for the Washington office to handle on Association affairs. He discussed in particular the proposed reclassification of Class A (see page 16) telephone carriers and stated that the matter has been placed before the FCC and a committee of the NARUC. At present the system places in the same category a company with an annual revenue of $100,000 with that of a company having $200,000,000. He reported no action as of this date however assured the Conference that the Association was keeping in close touch on that important subject. He also discussed the recent order the FCC has issued to the A. T. & T. Company and all Bell System companies to show cause why toll rates should not be reduced, and the possible effect it might have on Independents.

The closing address of the first day was given by Donald McGibeney, well known soldier of fortune and radio commentator. His interesting discourse proved so popular that he held his audience overtime and at the same time

EDITORIAL—

"The Lord Helps Those Who Help Themselves"

ON APRIL 2, 1941 the Federal Communications Commission issued two orders to the Bell Telephone System. One order directed the American Telephone and Telegraph Company to show cause why its long distance toll rates should not be reduced. The other order is, in effect, a questionnaire, under which the Bell System is directed to answer certain important questions having to do with such salient matters of the telephone business as property values, rate of earnings, depreciation and so on.

We call the attention of every Independent telephone company to these two orders, for reasons we are giving herein.

The first reason is stated in the press release given out April 2nd by the Federal Communications Commission regarding these two orders. That release says in part:

"Any principles which may be established by the Commission in this case will have a fundamental and far-reaching effect upon telephone rate regulation throughout the country."

The second reason is this: Any principles established by the Federal Communications Commission in this case will eventually—if things go on as they are now going on—affect Independent companies as well as Bell companies.

When we say "if things go on as they are now going on," we mean that if the state public service commissions continue to adopt in a large measure the principles, theories and methods of regulation of telephone companies that are adopted and promulgated by the Federal Commission, and undertake to apply those principles, theories and methods to the small as well as the large telephone companies under their jurisdiction.

The situation of the Independent companies is in many respects so different from that of the Bell System that regulatory innovations the Bell System could take in its stride might be a death blow to many Independent Companies.

The questions upon which the Federal Communications Commission has ordered the Bell System to state its opinions, involve such basic matters as the method to be adopted in arriving at a rate base; the method to be used in arriving at accrued depreciation; the relations between the depreciation reserve and annual depreciation charges; the factors covered by depreciation expense and depreciation reserves; the matter of what is a fair return, and so on.

THESE and other questions implied by them can well be called vital questions. The answers to them, as the Commission has said in its newspaper publicity, will have a fundamental and far-reaching effect on telephone rate regulation. If the Commission's decisions on them are wrong, that effect may be devastating to the telephone industry.

If the answers are wrong and are applied to the Independent telephone industry, that effect will certainly be devastating to many Independent companies.

Independent companies are under many different ownerships. They "live or die, sink or swim, survive or perish" according to their individual gross receipts, expenses and net returns. They do not supply universal service. They are in some important respects, in almost a different business from that of the Bell System.

Generally speaking, all commissions, Federal and State, recognize these facts. None of the commissions, so far as we know, are unfriendly to the Independents. None of them want to kill off the Independents. The trouble seems to be that, under the present scheme of things, the Independents do not escape having visited upon them whatever principles, theories and methods of regulation are applied to the larger system.

A committee of the National Association of Railroad and Utilities Commissioners proposed, some months ago, that there should be a separation in accounting classifications between large and small Class A telephone companies. This committee's recommendation came to the point that a telephone company with a gross annual revenue of, say, $101,000, should not have to be dealt with by regulatory bodies on exactly the same basis as a company with gross annual revenue of many millions of dollars. This recommendation seems to be an answer to most of the problems propounded herein; it should be the hope of all concerned that it will receive attention in quarters where something can be done about it.

"The Lord helps those who help themselves." This is, we think, an appropriate time to suggest that if Independent companies want action on such things as this, they will have to be active themselves. We think the United States Independent Telephone Association fully understands that. We expect, therefore, to see that organization vigilant and active in protecting the Independent telephone industry in the developments that will arise in connection with the orders recently issued by the Federal Communications Commission to the Bell System.

John H. Agee, Chairman Wage-Hour Committee.

almost covered the entire world in his discussion. Officials of the association in charge of arranging the program were gratified by the many commendatory messages received on their presentation of Mr. McGibeny as the only "outside" speaker to appear.

THE second day session started with no delay. The report of the Commercial Committee was given by Chairman J. T. Carliss of Marion, Ohio. His suggestion that the recommendations and resolution of the Association in its 1940 meeting be deferred until more normal time was approved by the Conference. This resolution concerned the formation and plans for employee training, publicity, service sales, and kindred subjects.

F. E. Behm, Lincoln, Neb., Chairman of the Plant Committee, presented the most important subject of delivery of equipment and supplies at the present time. He suggested a closer relationship between buyer and seller that each might know the others difficulties and in that way co-operate to the best possible advantage in deliveries. Manufacturers of telephone equipment are not now in a very advantageous position in the way of Priority under the the OPM and many present voiced approval that this be brought to the attention of that governmental body as the communications industry is most necessary in defense activities.

The transcontinental toll cable which crosses the territory of the Lincoln Tel. & Tel. Co., and in which that company is financially interested was discussed by Mr. Behm. He brought samples of the cable being installed which attracted much attention and discussion following the session.

E. W. Olschner, Tarboro, N. C., was presented by Mr. Behm and gave a paper which was distributed to the conference outlining in detail the activities of the North Carolina Utilities Coordinating Committee which was started during the past few years by the North Carolina Association. The growth and effectiveness of the committee has grown so large and its activities so impressive that Mr. Olschner was able to stress the value of coordination of efforts of all utilities companies under a common purpose. Under the Committee there is almost no trouble of REA inductive interference in his state and very little reason to expect any. We have several copies of this paper available to readers writing the editor.

E. C. Blomeyer, Chairman Depreciation Committee.

The activities of the Depreciation committee were reported by Chairman E. C.

(Please turn to page 30)

E. M. Blakeslee, Chairman Toll Compensation Committee.

R. E. Williams Selected as A Director of U.S.I.T.A.

R. E. WILLIAMS

Robert E. Williams, Ft. Wayne, Indiana, was elected a member of the Board of Directors of the United States Independent Telephone Association at a meeting of its Board of Directors at the Stevens Hotel on April 29th.

Mr. Williams entered the employ of the Telephone Bond and Share Company in Kansas City in 1927, after having been with the Corporation Trust company for four years, the last three of which he served in the capacity of manager of the Kansas City office of the Corporation Trust company.

Since 1927 Mr. Williams has occupied various positions with Theodore Gary and Company and its subsidiaries, carrying on principally corporate, secretarial, financial and telephone operating activities, during which period he has been located in Kansas City, Chicago, and Fort Wayne, Indiana.

In September, 1939, Mr. Williams established headquarters in Fort Wayne, Indiana, and has since devoted his services to the telephone operating companies subsidiary to Telephone Bond and Share Company.

Plan Higher Priority Rating for Telephone Manufacturers

THE original classification of a B-7 rating on strategic materials for civilian telephone apparatus and equipment which was promulgated by the Stettinius Priorities Division of the Office of Production Management may be revised upward in the near future with the possibility of a B-4 rating. This was indicated by OPM officials to TELEPHONE ENGINEER recently, because they were aware of the importance of civilian telephone service and realized that the B-7 rating was too low probably to meet the needs of the telephone manufacturing industry in supplying equipment to the operating companies.

So far this revised classification is in the discussion stage. but OPM officials indicated that the B-7 rating is not definite by any means and was only issued as a tentative allocation when the OPM had to rush through its classifications. It is noteworthy that while the preference ratings only apply at present to aluminum a number of other strategic materials, probably zinc, copper, steel and rubber, may be placed on a rationing basis for civilian production. The House action in establishing a separate Priorities Division, if it wins the approval of the Senate, is a most important move in authorizing mandatory priorities in place of the existing voluntary system and empowering the government to ration civilian supplies of materials.

The OPM stressed that telephone manufacturing companies which feel that they are suffering a hardship in their supplies of aluminum under the B-7 rating can make a complaint and showing about their situation which if proved would result in relief.

The OPM ranks the communications manufacturing industry, particularly the telephone manufacturers, in the top flight of American industry in meeting national defense demands. Even though more and more production is the keynote of the government defense authorities, it was stated that the telephone manufacturing industry was in excellent shape to expand and speed up its production. It was stressed that the telephone manufacturers have been able to anticipate needs for the supplying of equipment to Army and Navy establishments and government finance defense plants and installations have been on time in practically every case. The OPM officials added that the excellent cooperation between the telephone operating companies and the Army Signal Corps was responsible for these good results to a considerable extent.

The charge of failure to subcontract their defense contracts is not applicable to the telephone manufacturing industry, it was cited by OPM sources. The telephone manufacturing industry has been subcontracting their work "pretty extensively" and it was noted that as an illustration Western Electric at its Kearny, N. J., plant has been subcontracting about half its work. So far, the telephone manufacturing industry has had no trouble or great shortage in obtaining machine tool supplies, according to OPM, unlike the situation in a number of other defense industries.

Manager Called to Army

Mr. T. O. Cagle, formerly manager of Illinois Commercial Telephone Company at Flora (Ill.) has been called into the army.

He has been succeeded by Carl Watts of Grayville.

Museum Phone Exhibit

The Museum of Science and Industry (Chicago) has accepted a new contract from the Bell Telephone Company and Western Electric, Inc., that calls for enlarging and rearranging the telephone exhibit on the museum's main floor.

The museum's industrial participation program provides that the industry shall pay part of the expense and the Bell System is the first company already having an exhibit in the museum that has revised its contract to come into the new program.

This new exhibit, which demonstrates the scientific harnessing of sound waves for telephonic communication, will include the millionth telephone installed in Chicago. There will also be early communication sets from the time of Bell to the present and a display of 348 parts of the modern telephone.

Missouri Exchange Changes Hands

The Rich Hill Telephone Company of Rich Hill, Missouri changed hands April 1. Mr. and Mrs. A. L. Shopper of Holton, Kansas are the new owners having purchased the property from Mr. and Mrs. E. O. Turner who in turn purchased it in 1938 from the Missouri-Union Telephone Company of St. Louis.

Mr. and Mrs. Shopper have been in the business for the past 26 years. He recently resigned his position as manager for the United Telephone Exchange at Holton, Kansas and is now in active charge of his new property.

In a letter to TELEPHONE ENGINEER, Mr. Turner stated that he would possibly locate somewhere in North Missouri, however, at present his address is 5 South Williams Street, Columbia, Missouri.

Change of Ownership

Application has recently been made by B. F. Murphy to sell and Omar Hilkerbaurmer to purchase the Rosebud Telephone Exchange and property located at Rosebud, Missouri.

Illinois Convention on May 28th and 29th

ANNOUNCEMENT from A. J. Parsons, secretary, of the Illinois Telephone Association, leads us to predict that their 1941 Annual Convention will be a record-breaker. It will be held May 28th and 29th at the Hotel Pere Marquette, Peoria, Ill.

The Traffic Conference under the direction of Mrs. Mayme Workman will convene at 10 o'clock on the morning of the first day and will adjourn at noon in order that traffic people may attend the first General Conference starting at 2:00 p. m. A well known inspirational speaker and a high ranking army officer will address the general conference at that time.

The entire day of May 29th will be devoted to general sessions where three well-informed traffic people will appear on the afternoon program following the morning session which will be devoted to a panel discussion consisting of topics of interest to tributary and toll center operators. An open forum will also be presented.

Mr. Parsons has notified us that everyone attending the Traffic Conference is being invited to submit a suggestion on, "What can be done to make telephone service more pleasing to the public?" Awards will be made for the three best suggestions offered.

On the evening of the first day an informal banquet and dancing party will be held at the hotel starting at 6:30 p. m.

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by
ROLAND C. DAVIES
Editor, Telecommunications Reports

FCC Rate Inquiry

AN investigation and hearings to determine just and reasonable methods and rules for the separation and classification of the property and expenses of telephone carriers between interstate and intrastate services was asked of the Federal Communications Commission by the American Telephone and Telegraph Co. and its Associated Bell System Companies May 12, simultaneously with their filing of a statement brief and answers to the Commission's questionnaire contained in its April 1 supplemental order for its Long Lines rate inquiry.

In proposing the separation investigation as an initial step in the Long Lines rate inquiry, the A. T. & T. and Bell System Companies suggested that the FCC should invite the state commissions to participate in the formulation of separation methods. In addition, the petition proposed that the conduct of any such hearings could be "greatly expedited" by prehearing conferences between the staffs of the FCC, state commissions and the telephone companies and the latter would welcome such conferences, being ready to participate in them immediately.

The highlights of the telephone companies' reply to the FCC questionnaire were:

1. That in regard to the feasibility of using original cost to determine the rate base of the interstate telephone plant the companies were willing and offered to "stipulate" that, if an inventory and appraisal of the used and useful property in the Long Lines service were made as of Jan. 1, 1941, to ascertain reproduction-cost-new, exclusive of going value, working capital and materials and supplies, the total amount would be equal to the actual cost of the property on that date as shown on the books of the companies. This stipulation, it was added, was only for the current FCC proceeding and not for any other proceeding or any other purpose.

2. For existing depreciation or accrued depreciation, the telephone companies offered to the FCC to stipulate the amount, based on various studies of the properties in recent years, to show the present condition of the interstate property to avoid the great time and expenses required for the inspection of the properties. This stipulation, likewise, would be only for this proceeding. The companies stressed that their stipulations on reproduction-cost-new and for existing depreciation should not in any way commit the FCC or its staff or the Bell System to any particular theory or formula for the determination of fair value of the property or the rate base.

IN ITS inquiry into the reasonableness of the present Long Lines rates, the FCC was warned by the A. T. & T. and Bell System companies to take into consideration as "a right and duty" besides the current rate of earnings the "abnormal and critical times now and for the immediate future confronting the country and imposing" upon the companies "heavy responsibilities with respect to vital communication services." The statement advised the Commission that it would be a mistake to prescribe rates on the assumption that the current rate of earnings was more than temporary and to fail to recognize and give proper weight to other more important and fundamental considerations, such as the present tremendous increases in plant about $25,000,000 and the additional annual expenses for maintenance, depreciation and taxes estimated roughly at $2,000,000, together with the present trend of much higher taxes and expenses and the signs of a labor shortage with substantial rises in wages in sight.

The A. T. & T. and Bell System statement stressed that the telephone companies made their proposals both in their petition for a separation hearing and in the answers to the Long Lines rate questionnaire with the desire to keep the latter proceeding to a minimum of time and expense. The telephone companies emphasized that the demands upon the time of the companies' personnel due to the national defense emergency are such as to make the companies "especially concerned to see" the time and effort for the proceeding be kept as low as possible.

In its petition for an investigation and hearings to determine definite and reasonable methods and rules for the separation of interstate and intrastate property and expenses of telephone companies, the A. T. & T. Bell System petition stressed that they should not be called upon to undertake such a study if their methods are unacceptable to the FCC as had been cited by the Commission in its Feb. 3, 1941 finding in the Pacific Telephone and Telegraph interstate rate decision. By having methods and rules established by the FCC through an investigation and hearings as proposed by the A. T. & T. Bell System petition, the separation studies in the pending Long Lines rate proceeding, now scheduled by the FCC to start hearings on June 9, could be made free from "needless controversy" and would be applicable to subsequent rate cases and for more expeditious trial of rate cases. The telephone companies pointed out that their methods of separation studies, which were rejected in the Pacific Telephone and Telegraph decision by the FCC, had been generally approved by state commissions and courts for approximately 20 years.

The A. T. & T. and Bell System petition for the separation methods hearings and the statement and answers in response to the FCC rate inquiry questionnaire were prepared and submitted by Kenneth F. Burgess, Vice President and General Council of the Illinois Bell, Alan J. McBean, General Solicitor of the A. T. & T., Fletcher Rockwood, who has been counsel for the Pacific Telephone & Telegraph Co. in rate cases including the recent FCC inquiry into Pacific Co. interstate charges, and Frederic Sammond, who has been counsel of the Wisconsin Telephone Co. in several major rate cases. Charles M. Bracelen, Vice President and General Counsel of the A. T. & T., S. Whitney Landon, general attorney of the A. T. & T. Long Lines, and John T. Quisenberry, A. T. & T. attorney, were "of counsel."

Opposition on Telephone Excise Taxes

THE telephone industry may be relieved of the increased burden of excise taxes—the new 5 per cent levy on telephone bills and the increased tax rate with lower exemptions on long distance calls—when the House Ways and Means Committee finally writes the new tax bill which it is now studying and making the subject of extensive hearings. These two excise taxes which were proposed by the Treasury Department as good sources for governmental revenue produced the surprising opposition of two leading New Dealers, Leon Henderson who heads the Defense Price Control Administration and Marriner Eccles, Federal Reserve Board Chairman.

The views of Henderson and Eccles that these telephone excise levies were a burden upon the general public and were unnecessary and deflationary taxes constituted most potent opposition to the Treasury proposals and might be an important medium of persuasion to the Congressional tax bill drafters in possibly eliminating or reducing the new 5 per cent levy on telephone bills and in preventing the projected increased rates on the "communications message" tax. However, it was believed that the Joint Congressional Tax Committee in its final preparation of the new tax bill will reach a compromise between the Treasury Department proposals and the Henderson-Eccles ideas which might result in a smaller levy on telephone bills and the raising of the projected 15 cent exemption on long distance calls up to near the present 50 cent exemption.

The Treasury Department plan estimated that the increased excise levy on interstate communications messages, telephone, telegraph, cables and radiograms, would yield a revenue of around $40,400,000. The 5 per cent tax on telephone bills would produce an estimated $28,600,000. While both these levies would be borne by the telephone subscribers and users, the effect of these increased taxes on the volume of telephone service, especially on long distance calls, would be harmful and would tend to reduce the revenues of the telephone companies, it is believed.

While Congress is disposed to reduce the Treasury proposals for sharply increased surtaxes on the lower middle class incomes from $2,000 to $10,000, no change can be expected with regard to the higher rates for the corporation income tax and for the excess profits tax. In fact, there is a growing support for the boosting of the excess profits tax rate above the Treasury proposal so that this levy can produce the revenue which might be lost through lowering of the middle class income surtaxes. Among new levies now being studied is the idea of a general sales tax and a special levy on radio broadcasting stations, based on their transmitter power.

Convention Dates

Pennsylvania Independent Telephone Association, Penn Alto Hotel, Altoona, Pa., May 15, 16 and 17.

New York State Telephone Association, Hotel Jamestown, Jamestown, May 20 and 21. Golf day, May 19.

The Illinois Telephone Association, Hotel Pere Marquette, Peoria, May 28 and 29.

Wisconsin State Telephone Association, Loraine Hotel, Madison, June 4 and 5.

N. D. Independent Telephone Association, Leeland Parker Hotel, Minot, June 11 and 12.

Washington Independent Telephone Association, Cascadian Hotel, Wenatchee, June 13 and 14.

Oregon Independent Telephone Association, Portland Hotel, Portland, Oregon, June 16.

California Independent Telephone Association, Miramar Hotel, Santa Monica, June 19 and 20.

Michigan Independent Telephone Association, Hotel Olds, Lansing, July 23 and 24. Golf day, July 22.

Telephone Section—Association of American Railroads, Hotel Gibson, Cincinnati, Ohio, Sept. 23, 24 and 25.

U. S. Independent Telephone Association, Stevens Hotel, Chicago, October 14, 15, 16, and 17.

Bombing Effects

A NUMBER of highly interesting studies on the effects of airplane bombing upon telephone systems, based on the experiences in England have been recently published by the defense government authorities in Washington and to a major extent the results of the studies in Great Britain have shown that underground telephone cables and aerial cables suffer the least damage from bombs. The study which was issued by the Office for Emergency Management stressed that for important buildings and factories emergency service communications facilities should be maintained with duplication of lines and telephone stations. Telephone switchboards should be given special attention in protection against bombing effects.

The bulletin stated that "underground telephone cables suffer probably the least from the effect of bombs since the conductors can stand considerable displacement and bending without destruction, although it was noted that underground utilities in the immediate vicinity of a bomb crater are usually completely shattered. Telephone cables on poles suffer little damage unless their supporting structures are destroyed. The coaxial cable is easier to restore and it is noted that no underground cable in London has been completely safe from bombing damage except those placed far below the surface in locations like the underground subway tubes.

It has been found in England that "the best telephone operators are women," but the British are now using men as night operators. The report pointed out that "while telephone facilities have been widely disrupted during the bombing raids emergency repairs have been accomplished with unex-

(Please turn to page 44)

Don't Miss the July 15th Issue

In line with its new editorial policy of giving its readers the maximum amount of practical, useful and up-to-the-minute information in every issue, we call attention to our July 15th number.

This issue will be devoted largely to telephone circuit and transmission tests. The latest testing methods with full description of measuring apparatus will be featured. Useful data that every Wire Chief and Troubleman needs will be fully covered. Some of the feature articles that will be included are:

- **Circuit Testing Methods**
- **Modern Transmission and Noise Tests**
- **The Indespenable Ohmmeter**
- **New Testing Units**
- **Routine Measurements on Switchboards.**

Here is an issue that every telephone man will want to read from cover to cover. Don't miss it.

Wire Chief's TRAINING COURSE

(Prepared Expressly for **TELEPHONE ENGINEER** *magazine by the Lincoln Engineering School)*

Sec. III – Pole Line Design

General

IN THE operation of a telephone system it is necessary to replace defective poles in existing lines and to build new pole line to care for plant extensions. Some knowledge of pole line design is therefore desirable on the part of the well informed wire chief.

In the interest of economy, the size pole selected for either replacement or for new work should be of adequate size to carry the maximum load to which the pole will be subjected (safety factor considered) and of such height as to provide proper tree and road clearance. The use of poles larger than necessary, however, is wasteful and poor management. The public often judges a telephone company by the appearance of the outside plant, hence pole lines should be so constructed as to appear to best advantage as is shown in Fig. 1.

From a practical standpoint it is not necessary to compute the wind pressure and other loading factors of each pole that is installed in order to determine the amount of wood required as one soon learns by experience and observation of what other companies are doing as to the approximate size pole needed for a given wire load. However, as previously stated, those that pride themselves on a complete knowledge of telephone work should be familiar with design methods.

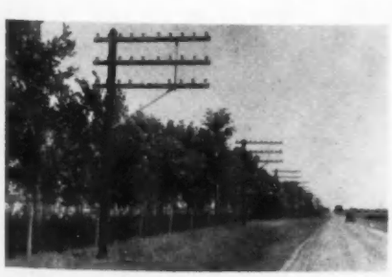

Fig 1-A — Well Designed Line Using Off Set-Arms to Clear Trees.

Design Basis

THE selection of the class of pole for a given line must take into account the existing and future wire and cable load which the pole will carry, the storm loading area in which the pole is used, and the desired factor of safety. Simple formulas enable an accurate computation of the total force which will be exerted at the ground line of the pole due to the combination of wind and ice to be expected in the storm area involved. It is considered good practice to design major toll lines with a safety factor of 1.0, minor toll lines with a S.F. of 0.50, and rural lines a S.F. of 0.33.

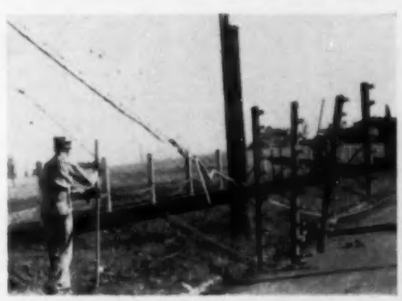

Fig. 1-B — Line That Went Down Under Storm Conditions and That Lacked Adequate Pole Circumference for the Number of Wires Carried.

Fig. 2—Storm Loading Map of the United States (Courtesy Bureau of Standards).

District	Thickness of ice	Horizontal wind pressure on projected area of cylindrical surface	Temperature (F)
	Inches	Lbs. per sq. ft.	
Heavy loading districts (H)	0.25	8	0
Medium loading districts (M)	0.50	8	+15
Light loading districts (L)	None	12	+30

Table No. 1—Loading Factors for the Three Districts

A loading map shown in Figure 2 and prepared by the Bureau of Standards recognizes three loading areas, known as **heavy, medium** and **light** and takes into account the severity of the average storm to be expected. It should be recognized that the areas established are general and that local conditions and knowledge of regional storms should be taken into account in applying the loading factors. If high wind velocities are frequent in a given place the loading for that place may be classified as heavy even though ice does not accumulate to any great extent. The assumed weather conditions for the several districts are shown in Table No. 1.

The definitions of loading as shown by the table are as follows: **Heavy loading**—The resultant loading, due to the weight of the conductor plus the added weight of a layer of ice 0.5 inch in radial thickness, combined with a transverse horizontal wind pressure of 8 pounds per square foot on the projected area of the ice-covered conductor, shall be called heavy loading. The minimum temperature shall be assumed as 0°F. **Medium loading**—The resultant loading due to the weight of the conductor plus the added weight of a layer of ice 0.25 inch in radial thickness, combined with a transverse horizontal wind pressure of 8 pounds per square foot on the projected area of the ice-covered conductor, shall be called medium loading. The minimum temperature shall be assumed as +15°F. **Light loading**—The resultant loading due to the weight of the conductor without ice combined with a transverse horizontal wind load of 12 pounds per square foot on the projected area of the conductor, shall be called light loading. The minimum temperature shall be assumed as +30°F.

Fig. 7 — Highway Crossing Should Provide Adequate Road Clearance.

Computation of Pole Size

WITH storm loading conditions defined the computation of the required ground line circumference on a pole line which is to meet a given safety factor can be computed by the simple formula

$$Mw = P\ L\ D\ N\ S$$

Where: P=pressure on wires in pounds per square foot due to wind and ice
L=distance in feet from the ground line to the approximate center at which the load is fastened to the top of the pole.
D=diameter in feet of wires including ice coating
N=number of wires or equivalent wires on the pole
S=average span length

To get an accurate computation of the total load tending to bend the pole at the ground line the pressure of the wind against the pole should also be taken into account. The load due to wind pressure against the pole is only a small part of the total, hence may be neglected for rough computations. The wind load against the pole can be computed by the formula:

$$Mp = \frac{h^2}{226.2}\ (2Ct + Cg)$$

Where: P=pressure against pole in pounds per square foot
h=pole height from ground
Ct=top circumference of pole
Cg=ground line circumference of pole

After the total bending moment in pounds due to the action of wind against wires and pole is computed, the safety factor for the type of line involved is applied. (MP+Mw) × S.F. = Required pole strength. The correct pole can then be selected from a table which gives the resistance moments of poles of various types or may be computed by the formula $M = .000264FC^3$. (Such tables are available from pole supply companies.)

Where: M=resistance moment in foot pounds
F=the fiber strength of pole used in pounds per square inches
C=the ground line circumference of the pole in inches.

(Please turn to page 34)

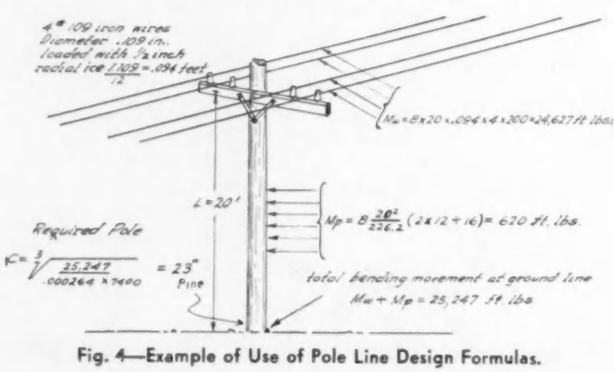
4 #.109 iron wires
Diameter .109 in.
loaded with ½ inch
radial ice .109/12 = .094 feet
Mw = 8x20 x .094 x 4 x 300 = 24,627 ft. lbs.
L = 20'
Mp = 8 20²/226.2 (2x12+16) = 620 ft. lbs.
Required Pole
C = ∛ 25,247 / .000264 x 7400 = 23" Pine
total bending moment at ground line
Mw + Mp = 25,247 ft. lbs

Fig. 4—Example of Use of Pole Line Design Formulas.

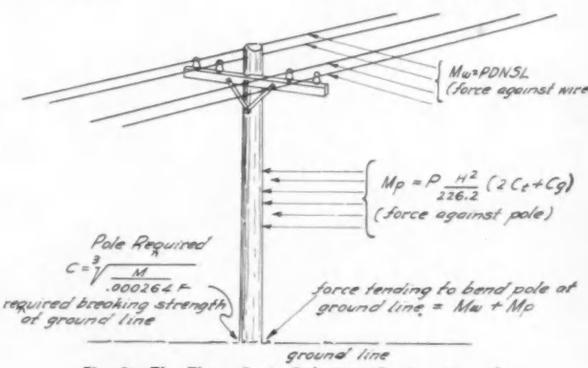

Fig. 3—The Three Basic Pole Line Design Formulas.

By

B. C. BURDEN

Technical Editor

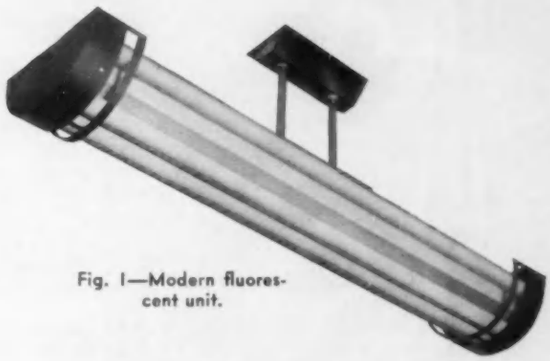

Fig. 1—Modern fluorescent unit.

Fluorescent Lighting for Telephone Offices

General

Since its introduction and particularly during the past year fluorescent lighting has become so popular that it is conceivable that it will ultimately replace all other types of lighting, especially in industrial merchandising lighting installations. There are several reasons for this quick popularity. One of the principal advantages is operating economy. A fluorescent light requires just half the power required by an incandescent lamp. A modern fluorescent unit is shown in Figure 1.

The range of colors produced by the fluorescent light far exceeds that of other artificial light sources, and is the nearest practical equivalent of north sky light. Since the fluorescent light bulb is comparatively long, the diffusion area is quite large and rectangular in shape, and fluorescent lights therefore produce a more even distribution of light than incandescent type lights. Inasmuch as the fluorescent light operates at a high efficiency it produces very little heat. Typical fluorescent tubes are shown in Figure 2.

Factories are making wide use of this type of lighting since it offers an abundance of good white light with no shadows which permit the workman to turn out precision work in minimum time. Printing establishments find fluorescent lights ideal since the light permits accurate matching of colored inks in color printing. Because of its rectangular pattern fluorescent lighting is well suited for use in operating and terminal rooms in telephone offices.

This article discusses at some length the theory and general features of flourescent lighting.

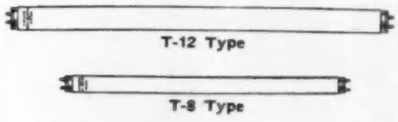

Fig. 2—Typical fluorescent tube.

What It Is

The fluorescent light is essentially a long tube with a filament in each end, a phosphorous coating on the inside of the glass, and containing a small amount of gas.

The gas used in the tube consists of a substantial amount of mercury vapor and a small amount of argon. When this gas mixture is ionized by an electric voltage it generates large quantities of ultra-violet light. The ultra violet light striking the phosphor coating in the tube causes the chemical coating to fluoresce thus radiating large quantities of light. The color of the light emitted is governed by the composition of the phosphor, and by the proper mixture of chemicals, the phosper coating is made to emit a white light having virtually the same characteristics as north day light, containing all the colors from violet to dark red.

Unlike neon type signs, the exciting voltage cannot be applied directly to the two cold electrodes at the ends of the tube. The mixture of mercury vapor and argon, which are used to produce the necessary ultra radiation must first be warmed slightly and the electrodes heated before ionizing can take place. This is accomplished by passing current through the filaments at each end of the tube. After the

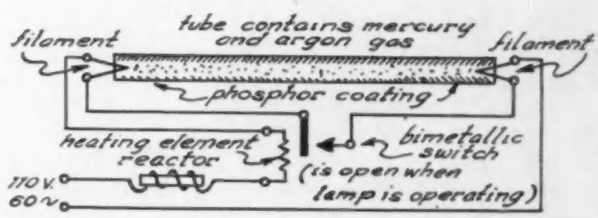

Fig. 3-a — Fluorescent unit with old style thermostatic starter.

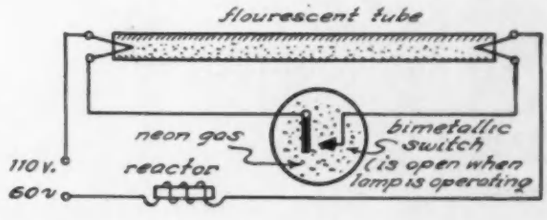

Fig. 3-b — Fluorescent unit with new neon starter.

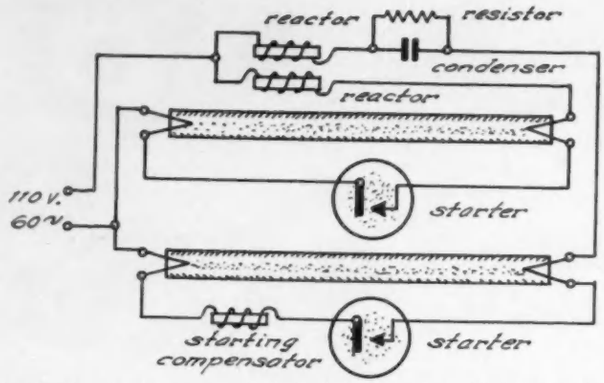

Fig. 4 — Two lamp fluorescent unit.

initial heating is accomplished, the filament circuit is disconnected and the exciting voltage then appears across the two filaments which operate as cold electrodes.

Basic Fluorescent Circuit

THE basic electrical circuit of a fluorescent tube is shown in Figure 3-A. Two spiral filaments are located one in each end of long evacuated tube, containing mercury vapor and argon gas. When the switch is closed the filaments are connected in series with a reactor (called a ballast) and a thermostatic switch. The filaments heat up and "condition" the gas and electrodes and start ionization of the mercury vapor and argon. After a few seconds the thermal switch automatically opens the series connection of the filaments and reactor and interrupts the current flowing through the reactor. This interruption of the current flowing through the reactance results in a high voltage being impressed across the electrodes and this voltage is sufficient to "strike the gaseous arc" after which the normal 115 volts is sufficent to maintain the arc. The winding of the reactance must have sufficient ohmic resistance to limit the current that flows through the ionized gas to a safe value.

Due to the action of the thermostatic switch, there is always a short time lag after turning on the switch before the unit produces light. This lag, which seldom exceeds a second or two is often disconcerting to a new user, but one soon becomes accustomed to it.

Thermostatic Switch

There are several types of thermostatic switches and the two principal types are shown in Figures 3-A and 3-B. The unit shown in Figure 3-A has a heating element in series with the line, the filaments, and the thermostatic contents. When the line switch is thrown so as to connect the light to the line, the thermostatic contacts being closed, the filaments and reactor are connected in series across the line. The filament current flowing through the heating element of the thermostatic switch causes a bi-metallic switch to open thus breaking the series connection of the filament. The high induced voltage produced in the reactor by the sudden opening of the filament circuit causes the gas to ionize and the ionization current flowing through the heating element of the thermostat is sufficient to keep the bi-metallic contacts open.

Fig. 5—Fluorescent sockets including starter socket.

The Neon Starter Unit

The starter unit shown in Figure 3-B consists of an evacuated glass tube containing a bi-metallic contact element and the tube is filled with neon gas. The action here is as follows: The bi-metallic contacts are normally open, therefore when the tube is first connected to the power source the full line voltage appears across the starter switch causing the neon gas to ionize. The heat generated by the ionized gas causes the bi-metallic contact mechanism to close and this in turn passes current through the filaments and reactor coil. The contacts upon closing short out the ionizing voltage in the starter causing the neon to deionize. With the neon deionized the bi-metallic element cools off and this causes it to fall back and open the contacts thus interrupting the current through the reactor as well as the filaments. The interruption of current through the reactor produces the necessary high ionizing voltage and the gas in the fluorescent tube ionizes and the normal operation of the tube takes place. Due to the voltage drop across the tube when in operating condition the voltage remaining across the starter is insufficient to reionize the neon gas. However, if the line voltage should be interrupted the starter will gain assume control and repeat the starting cycle.

This type starter has replaced the type using the heating element, and is now standard on virtually all modern fluorescent units.

Power Factor of Fluorescent Lights

Due to the fact that an iron core reactor is in series with every fluorescent lamp the current that these lamps draw lags behind the impressed voltage. The net result of this is, that the power factor of the energy supplied is only 50 to 60 as compared to approximately 100% for incandescent type lamps. A low power factor is objectionable from the standpoint of the power company as their system capacity is reduced and likewise from the standpoint of the consumer the lower power factor means that a given size wiring system will not carry as much energy as would be the case if the power factor was 100%.

Recognizing that unless something was done to improve the power factor of fluorescent lights power companies would penalize this type of electricity by a higher rate, companies manufacturing fluorescent equipment have recently been installing condensers in series with the reactance coils, thus providing a device which causes a leading current which counteracts the effect of the lagging current, thus improving the power factor. Modern properly designed units have power factors from 90 to 85%.

Stroboscopic Affect

Ordinary 60 cycle alternating current passes through zero voltage 120 times each second. Because gaseous type lamps do not have a thermal lag in the same sense that the ordinary incandescent filament type lamp does, the illumination given off by the lamp falls to a low value each time the voltage passes through zero. The effect of this is to cause a flicker. At 60 cycles, the flicker is sufficiently high that it is not readily apparent to the eye, however, it may be quite objectionable when flourescent lamps are used over or around rapidly moving machinery because of what is known as the **stroboscopic affect.**

This effect refers to the fact that a rapidly moving object may appear, if the object is moving or rotating at some multiple of the flicker frequency, to be stationary or rotating slowly in one direction or the other. In order to overcome this objection to the fluorescent lamp, it is necessary to use two lamps with the separate lamps arranged so that one lamp is out of phase with the other. That is, so that the current

(Please turn to page 41)

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Selection and Ordering of Lead Covered Telephone Cable

By JAY G. MITCHELL

(Conclusion)

In this installment the author touches upon the matter of determining the lengths of each type of cable to be ordered—The importance of securing flexibility in distribution—Uniform pair capacity versus tapered construction — Single and double wrapped insulation — Wood pulp insulation — Accessories as affected by type of cable — Kinds of Cable sheath.

Cable Lengths

WHEN the type, size and guage of conductor of the proposed cable has been decided, and it is important that **all of the characteristics of all the cable about to be ordered** be decided upon before the orders for any of it are placed, it is necessary to work out the length of each piece of cable and to fix the most convenient point at which each part shall be delivered. This is not by any means an unimportant element of the task because it directly affects the labor costs, the freight costs and the time required for the completion of the entire cable project. In other words it affords the management of the telephone company an opportunity to control some substantial elements of the final total cost by the use of intelligent planning.

Securing flexibility

THE preliminary study of the requirements for cable facilities will disclose the location and capacity of the points at which the cable conductors are to be distributed. The completed cable plan will also disclose the location capacity and type of cable terminal to be installed at each distribution point. Examination of any such cabling plan will show a reduction in the total number of cable pairs required for the anticipated service demands as the distance from the Central Office increases. The development study, for instance, may show that one hundred pairs are required for the first one thousand feet from the Central Office, seventy five pairs for the next one thousand feet and not more than fifty pairs from that point to the end of the cable. Such a condition might appear to indicate that three sizes of cable in three separate pieces should, in the interest of economy, be ordered and installed. Such cable construction would constitute a tapering of the cable pair capacity from its maximum at the Central Office to its minimum at the outer terminal. In the average small or medium size telephone system it is the considered opinion of the author that such mixing of cable capacities is most unwise and can only result in difficulty later. The one size of cable should be installed from the Central Office to the final outer terminal. While this practice may appear to require the purchase of some larger capacity cable than is necessary in many cases it is not inadvisable and a few of the reasons why it is not inadvisable are the following.

Of course the ultimate requirement in cable pairs can only be determined by carefully made development studies which are not a part of the Selection and Ordering of Lead Covered Telephone Cable but must precede any intelligent effort to develop the cabling plan. In the assignment of cable conductors for party line service it is often necessary to use a cable pair for different parties on the same circuit at very widely separated cable terminals. In fact, when conditions are otherwise suitable, it is advisable, in the opinion of the author, to assign to a given party line circuit party line subscribers who are not located in the same general neighborhood if possible. The reason why this may be desirable as an established practice is obvious. Now when a given cable run is of the same capacity in pairs from the Central Office to the last terminal it is possible, obviously, to obtain the greatest possible flexibility in the assignment of multipled cable pairs appearing in the several distributing and terminating cable terminals. If the size of the cable is tapered from the Central Office outward, on the other hand, certain pairs which appear in the distributing terminals located near the Central Office cannot possibly be connected into as many distributing terminals as they might be if the capacity of the cable in pairs were uniform throughout. It might easily happen, as a matter of fact, that some of the cable pairs at the Central Office terminal of the cable might not be usable because they appeared at distributing terminals where they were not needed and did not appear and could not be picked up at the other terminals where they could otherwise be assigned for service.

Jay G. Mitchell

Another reason for uniform pair capacity from the Central Office to the final terminal is found in the costs of making the splices required because of the reel lengths of the cable in one case and the costs of making the splices at points where the capacity of the cable is changed in tapered capacity construction. In the first case the reel length splices are straightaway splices and in the case of tapered construction the reel length splices are more costly because the pairs to be spliced through must be identified in accordance with a detailed splicing plan. It is worthy of note that any such detailed splicing plan for tapered capacity construction must be made up with the utmost care and when so made is very apt to fail to cover an unanticipated shift in service demands from one terminal to another because such shifts in service demands are impossible of successful determination in advance. The most carefully prepared splicing scheme, therefore, may result in the loss, for all practical purposes, of certain cable pairs in tapered construction at some of the distributing terminals.

The splicing in of distributing terminals, of course, must be carried out in accordance with a definitely worked out plan of cable pair distribution. It is obvious that the availability of the average pair, when tapering construction is used, is sure to be lower than it would be if the same size of cable were used throughout. The factors in the problem which have been briefly outlined in favor of maintaining the same size cable from the Central Office to the final terminating cable terminal are applicable in the average small and medium size telephone system. There are many situations, however, in which especial conditions prevail and in such cases the use of tapering construction may be justified and, in fact, may be the only sensible plan to follow. The author has in mind a large city shaped like a huge dumbell with two telephone offices, part of the same exchange, located in one of the end circles. The installation of cable, whether it is placed in the air or underground, in such an area with telephone offices located in one end of the city introduces many factors which would not ordinarily have to be given more than incidental consideration and places the cable plan in the class of difficult problems to be solved only by the application of the most careful study to the conditions to be met. Certainly the acceptance of the dictum that the tapered construction would not be allowable in this case would not be justified unless most thorough study

(Please turn to page 39)

The efficiency of line construction and maintenance work, whether it be overhead or underground, necessarily depends a great deal upon the quality and design of the tools which are used. GRAYBAR'S long years of experience in meeting the tool needs of independent telephone companies, make it the logical source of specific tools for specific jobs. For, the tools which you buy from GRAYBAR have not only been designed for the job, but have also been pre-tested under actual field conditions.

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(Continued from page 17)

Blomeyer, Chicago. Details of the filing of a statement of the Association's position with respect to depreciation with the depreciation committee of the NARUC were given by Mr. Blomeyer who then introduced Mr. Ranford Dunlap, Ft. Wayne, a member of the committee who read the statement. (Note—complete report was carried in April 15 TELEPHONE ENGINEER.)

In the closing session of the second day the Chairman of the Accounting Committee, C. E. Archer, Tampa. Fla., reported the work done by his group on reclassification of the now Class A companies for accounting purposes. His report was supplemented by the report of I. J. Devoe, Lincoln, Nebr., who was called upon for a detailed report of actions to date.

After detailing the purposes of the reclassification Mr. Devoe concluded:

I. J. Devoe

"It appears that there is opposition on the part of the FCC to any reclassification at this time because no definite change in the accounting system was being asked, the implication being that until such time that definite accounting changes were recommended, no change in classification should be made.

"The accounting committee of the NARUC felt that the time to consider a separation was at the time the subject of continuing property records was under consideration or whenever there may be any proposal from any source looking toward the expansion of the accounting system.

"The USITA accounting committee has not yet agreed upon what revisions should be made in the present system of accounts in the event of a reclassification of companies. . . .

"To summarize the situation, it seems that there is good reason to believe that the reclassification can be accomplished and that thereafter some of the unnecessary burdens in the present accounting system can be alleviated."

John H. Agee, Lincoln, Nebr., Chairman of the important Wage-Hour Committee whose action in recent legislation was so important to the smaller exchanges, gave a report of the activities of that Committee during recent months. He outlined the procedure necessary when questions were brought up and an interpretation needed. Of much importance to exchanges of less than 500 stations was the announcement by Mr. Agee that he had been informed in a letter from the Wage-Hour Division to the effect that all field agents had been notified that the Division was making no attempt to apply the minimum wage prescribed by the law to operators in exchanges of less than 500 stations for the period from the inception, October, 1938, to August 9, 1939, when exemption was granted by Congressional action.

The Toll Compensation Committee, E. M. Blakeslee, Madison, Wis., Chairman, was indeed an important report as Mr. Blakeslee had much news for the Conference and for the industry. Mr. Blakeslee has done yeoman service to Independent companies in Toll Compensation matters. During his report he announced that the Ohio Bell is now offering to its connecting companies a new toll traffic agreement and a revised compensation schedule. He also informed the Conference that he had been informed that immediately after May 1 the Michigan Bell was preparing to offer an upward revision in its compensation schedule.

J. T. Carliss, Chairman Commercial Committee.

F. E. Behm, Chairman Plant Committee.

At the close of this address President Brorein thanked the various committees and officers and staff of the Association that made the Conference so successful. His action was so sincere and appreciated by the Conference that the adjournment which immediately followed was on a note of accomplishment even though there are many serious problems the industry must face in the next 6 months.

Phone Service Starts

Telephone service which was suspended at Puget Sound last November, was resumed April 1 under the sponsorship of the Puget Island Telephone Association, with Svere Pedersen as President, Elmer Danielson, secretary and treasurer, and John Berg, Harry M. Danielson and P. F. Jaspers as trustees.

E. W. OLSCHNER

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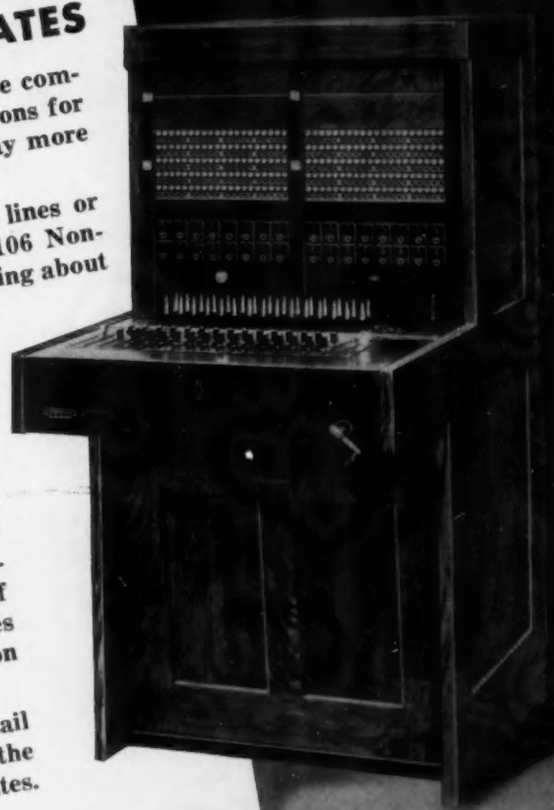

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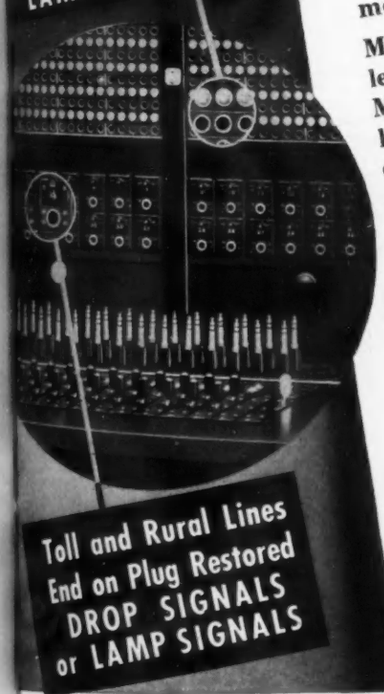
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Conducted by B. C. BURDEN, Technical Editor

Line AND Desk

Q. Will a weak magnet on a telephone receiver affect its receiving efficiency?

A. Yes, the receiving efficiency will be materially affected by a weak magnet. A good magnet should support the diaphram when suspended by its edge from the pole piece.

Fig. 1—Simple receiver magnet test.

General

Q. Of what value are house count maps in telephone work?

A. A house count map is made in connection with a new business campaign or when a company is about to engage in extensive rebuilding or plant extension work. In the latter case, a house count map by showing potential and existing subscribers enables the plant engineer to select the best routes for outside plants and to install cable of adequate capacity to take care of existing and possible future growth. Ordinary city maps are suitable for recording this information and a code should be used to designate the different type of subscribers and potential subscribers.

Inductive Interference

Q. What do the terms influence and susceptiveness as applied to inductive interference mean?

A. The term influence refers to the interfering effect of a power line on a paralleled telephone line, while the term susceptiveness refers to the sensitivity of the telephone circuit to outside influences such as power lines. The efforts of power companies should be directed in keeping the influence of their lines as low as possible and the telephone companies in keeping the susceptiveness of their circuits at a minimum.

Q. How can inductive interference be minimized on a party line which has ringers connected to ground?

A. Either by the use of high impedance ringers which limit the amount of noise current flowing to ground of by the use of a so called "gas relay," which are gas filled tubes which prevent noise currents from flowing to ground but which will ionize and permit the higher voltage ringing source to pass the ringing current to ground.

Q. If a single phase extension must be made from a three phase delta system what means can be taken to prevent unbalance on the three phase system and the resultant inductive interference on parallel lines?

A. An isolating transformer placed at the junction of the three phase and single phase lines will prevent a single phase line from unbalancing a three phase line.

Poles and Open Wire

Q. Can advantage be taken of the fact that in the various localities there is generally one direction in which prevailing storm winds are most severe?

A. Some companies do recognize the fact that storms usually come from the same direction, hence, build their pole lines stronger at right angles to these prevailing storm winds and correspondingly lighter on leads which parallel the prevailing storm winds.

Q. What do the terms lead and height mean as applied to pole line guys?

A. These terms refer to the distance that the anchor rod is placed from the pole. The term height refers to the distance from the point of guy attachment on the pole to the ground. The ratio of lead over height determines the amount of stress that will be placed on the down guy. This is an important factor in pole line engineering. Fig. 1 illustrates the significance of the two terms.

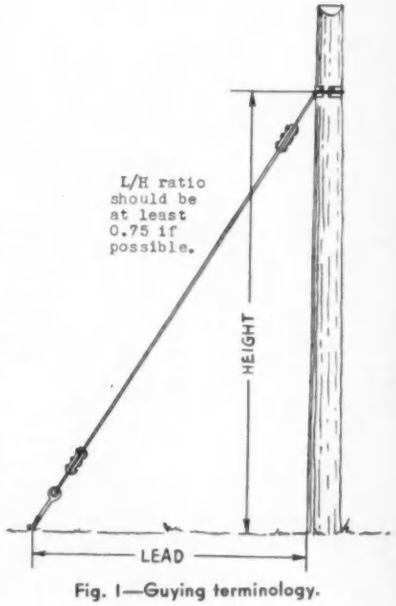
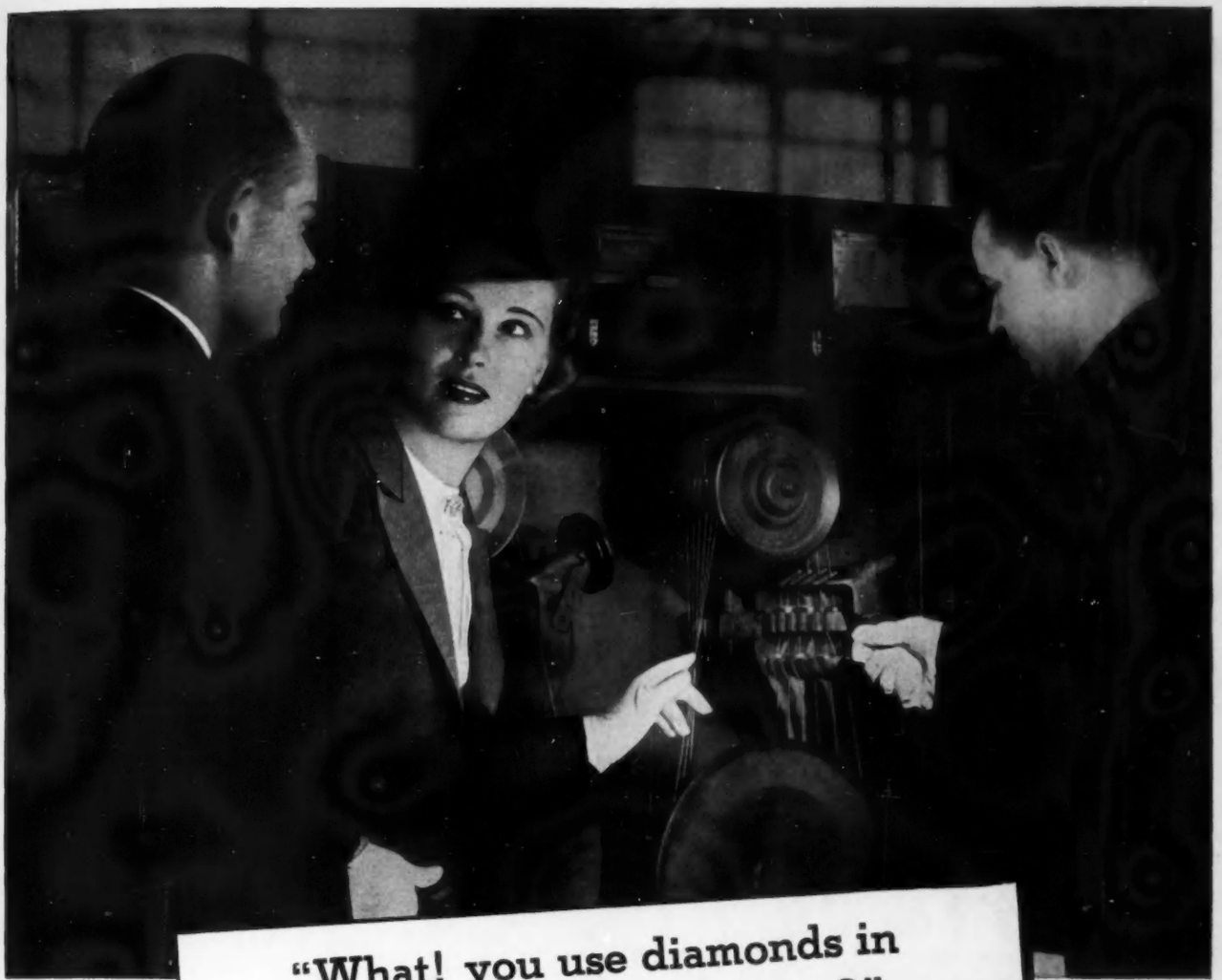


Fig. 1—Guying terminology.



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Wire Chief's Training Course

(Continued from page 22)

Example Computations

PROBLEM—What resistant moment at the ground line should a 25 foot pole have if it is to carry four 109 iron wires in the heavy loading district and which are used for rural service. The safety factor for a rural line need be only 0.33. The average span length is to be 200 feet. Assume load center 20 feet from ground.

Step # 1—Compute bending moment at ground line due to wind pressure against the wires.

$$Mw = P\ L\ D\ N\ S$$
$$Mw = 8 \times 20 \times .0924 \times 4 \times 200$$
$$= 11{,}827 \text{ foot pounds}$$

Note: D equal 1.0 inch diameter ice and .109 inch wire which must be converted to feet or

$$\frac{1.109}{12.000} = .0924$$

Step # 2—Determine the bending moment in foot pounds at the ground line due to wind pressure against pole.

$$Mp = P\frac{h^2}{226.2}(2Ct + Cg)$$

$$Mp = 8 \times \frac{21^2}{226.2}(2 \times 12 + 16)$$

$$Mp = 15.52\ (24+16) = 620.8 \text{ foot lbs.}$$

Note: In order to get the approximate top and butt circumference figures for above equation assume a class 10 pole which is 12 inches and 16 inches.

For those unfamiliar with equations such as the above be sure and handle in the following manner:

a—first square 21, then divide by 226.2

b—next multiply the result obtained by 8

c—next multiply 2×12 and add to 16 giving a result of 40

d—last multiply 40 by 15.52

Step # 3—Apply safety factor and select pole size.

Bending moment due to wind on poles and wires=

$Mw + Mp = 11{,}827 + 620 = 12{,}447$ ft. lbs.

$(Mw + Mp) \text{ SI } F = 12{,}447 \times 0.33 = 4107$ foot lbs.—required pole size.

Step # 4—Referring to a pole table (available from pole companies) it is found that a Class 10 yellow pine pole has a strength of approximately 8,000 pounds (based on 16 inch measurement 6 foot from butt, hence, is sufficiently close to the computed value to be used.)

Fig. 8—Poles in Alleys Should Be on Lot Lines Where Possible.

Equivalent Wire Load

INASMUCH as a pole may carry telephone wires, cable, or power wires or combinations of these three the effect of the wind on these various types of conductors must be considered. For simplicity in pole line computations the **equivalent wire factor** is used to take into account the difference in size of the different conductors or cables. That is, each type of attachment is considered as being equivalent to one or more 104 telephone wires. Table # 2 gives the number of 104 wires which are equivalent to various types of conductors and cables for the heavy loading area only. It should be noted that for light loading areas for equivalent number of wires will be somewhat greater for the various types of plant.

Type of Plant	104 wires
083, 104, 190, 128 copper or iron wires	1
Drop wire	1
25 to 150 pair cable	4
150 to 400 pair cable	5
400 to 1200 pair cable	6
No. 00 A.W.G. insulated copper power wire	1.4
No. 4 A.W.G. insulated copper power wire	1.3
No. 6 A.W.G. insulated copper power wire	1.2
No. 8 A.W.G. insulated copper power wire or smaller	1.1

Table No. 2—Loading Effects of Various Types of Plant (Equivalent to 104 Telephone Wire)

Fig. 9—Best location of pole lines which are on streets is at the curb line.

Where there are a number of wires on a pole line some of the wires act as a shield on the others preventing the wind pressure from bearing fully on all of the wires. This fact is taken into account by using less than the actual number of wires in the formulas. For the heavy and medium loading areas reduce the actual number of open telephone wires by 2/3 then add the wire equivalent of cables and power wires to get the total wire load. **Do not take 2/3 of the wires where there is less than 10 wires,** as in such cases you use the actual number of wires because the shielding effect is not substantial with the smaller number of wires. In light loading areas the shielding effect is ignored because the wires carry no ice.

Kinds of Pole Timber

THERE are several different types of poles which are utilized in the telephone field. The choice will depend largely upon supply conditions, prevailing prices, and geographical location. The principle kinds of poles are **eastern cedar, western cedar, chestnut** and **creosoted yellow pine.**

The strength of the various kinds of poles is rated in terms of pounds per square inch and is as follows:

Eastern Cedar	3600 pounds
Western Cedar	5600 pounds
Chestnut	6000 pounds
Creosoted yellow pine	7400 pounds

It is now standard practice to chemically treat either the butts or the entire pole in order to prolong the useful life of the pole. Treated poles can be expected to stay in service from 20 to 40 years, whereas in the untreated state their life will be relatively short.

The cedars and chestnut poles are usually given only a **butt treatment.** That is, perforations are made in the butt and the lower six feet of the pole is treated with creosote. This modern method insures the creosote penetrating deep into the wood thus making it particularly resistant to decay. Yellow pine is treated throughout its length inasmuch as it is some what more subject to decay in the untreated condition than the other wood species. However, when given full length treatment it makes an exceptionally long life that will stand for many years.

Decay in wood poles is usually due to a fungus growth which feeds on the contents of the wood cells of the pole causing them to break down. This action is accelerated when considerable moisture is present in the earth surrounding the pole. Poles may also be damaged by termites which eat out the interior of the pole leaving only an outer shell. Both termites and fungi are poisoned by the action of the creosote. In resetting old poles the life can be materially extended by brushing on the proper grade of penetrating creosote. The old poles being more or less porous will absorb a considerable quantity of a preservative. Yellow pine poles are treated full length by placing them in pressure vats and putting them through a process whereby all moisture is drawn from the wood cells by a vacuum process and then hot creosote is applied under pressure. The quality of a preservative treatment is tested by making what is known as **increment borings** which consist in obtaining by means of a small auger a wooden plug from the pole which will show the depth of penetration.

Span Lengths

IN designing pole lines one of the factors which will have considerable

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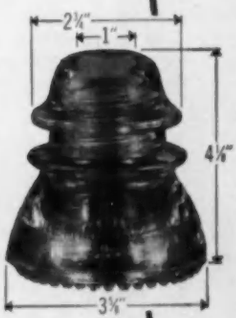

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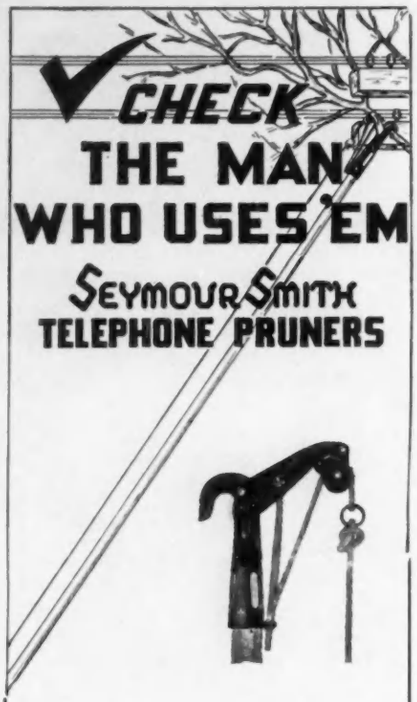

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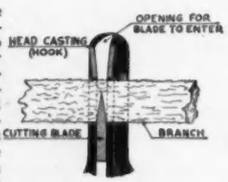

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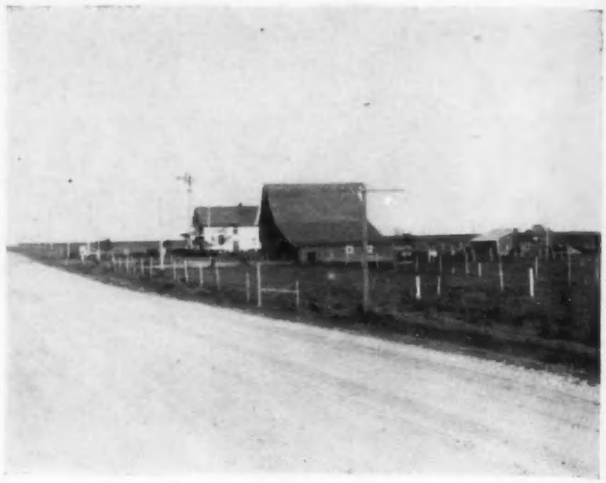


Fig. 10 — A well graded pole line which is graded up to pass over a farmers driveway.

effect on the cost of the line is the span length. The shorter the span the greater the freedom from shorts and crosses and in general the stronger the line will be to resist storms. The longer the line the fewer poles are required but the greater the hazards of storm damage. Frequently the economy of the fewer poles required on a long span basis will be off-set by the fact that taller poles must be used in order to get adequate ground clearance.

In general spans will range from 120 feet (44 poles per mile) up to 400 feet (13 poles per mile). Multi-wire leads which carry more than one cross arm will generally require spans not much in excess of 210 feet (25 poles per mile). On bracket leads particularly where the topography of the country permits the new high strength wire will permit spans up to 350 feet in the heavy loading areas and 500 feet in light loading areas. Generally, however, span lengths should be kept to 350 feet or less.

In laying out pole line, consideration must be given to such factors as clearance at entrance to farmers fields, driveways, above highways (see Fig. 7) and the necessity for supports at transposition points which should be close to the theoretical location. Advantage can often be taken of the fact that storm winds often come from the same direction due to natural shielding or other factors, hence pole leads which run parallel to the direction of the prevailing storm winds can utilize longer spans and somewhat lighter construction than those at right angles to the prevailing storm winds. Table No. 3 gives the number of poles required per mile for various span lengths.

Span Length	No. of Poles per Mile
100	53
125	43
150	36
175	31
200	27
225	23
250	21
275	19
300	17
325	16
350	15
375	14
400	13
425	12
450	11

Table No. 3—Poles per Mile for Various Length Spans

Location of Pole Lines

AN important consideration in the building of new pole lines or the rebuilding of the old is the location of the poles with respect to property lines. In town plant construction it is desirable that poles should be set on the rear property line and if possible, on the lot line between adjacent lots as illustrated in Fig. 8. Where located on streets, poles should be at the curb line as shown in Fig. 9. If located along rural highways, if possible they should be located one foot inside of the property line by permission of the property owner and with a recorded easement. Where not possible to get an easement they should be located just outside of the property line. The advantage of the pole being located by easement consent on private property is the fact that when highways are widened or banks sloped off by grading operations the telephone company can usually charge the expense of any necessary moves to the county or state who initiates the move.

Grading the Line

GOOD pole line practice dictates that the average change in grade of a pole line does not exceed 10 feet on adjacent poles. When necessary to cross over railroad tracks and built up highways the poles adjacent to the crossing span should be carefully selected so as

Telephone Wires or Cable over	Vertical Clearance
Public highways	13 feet
Railroads	27 feet
Driveway to private garages	10 feet
Farm driveways	15 feet
Sidewalks	8 feet

Table No. 4—Standard Vertical Clearances over Roadways, Railroads, Driveways, etc.

to gradually build up to the higher level as is shown in Figure 10.

Miscellaneous Notes on Poles

Poles which carry both telephone and power wires on a joint basis are usually made one size larger than would otherwise be indicated. For the average exchange joint poles will generally require a class 5 or 6 pole.

In planning new pole line the future growth requirements for both telephone and power circuits in the case of joint poles should be taken into account. Pole leads which cross railroad should conform rigidly to the Bureau of Standards safety rules and to railroad specifications. There is a common tendency to use poles at highway crossings that are too short to provide adequate clearance. Be sure that all crossing poles will provide at least the minimum clearance specified by the safety rules. In some states special laws require even more clearance than shown in the safety rules. Local laws should of course govern. Table No. 4 gives the clearance specified by the Bureau of Standards.

Mathematical Formulas, Etc.

● It will be necessary to include an occasional mathematical formula in the training lessons in order that certain phases of plant work be fully covered. The formulaes used will be relatively simple and easily understood on the part of those familiar with elementary algebra. If anyone has difficulty with the small amount of mathematics which is necessarily included in the course, this should not be discouraging as there will be only a few questions of a mathematical nature and even tho these are all missed, it will not have material influence on the grades necessary to qualify for the completion certificate. The standard answers which are furnished will show exactly how each problem is worked.

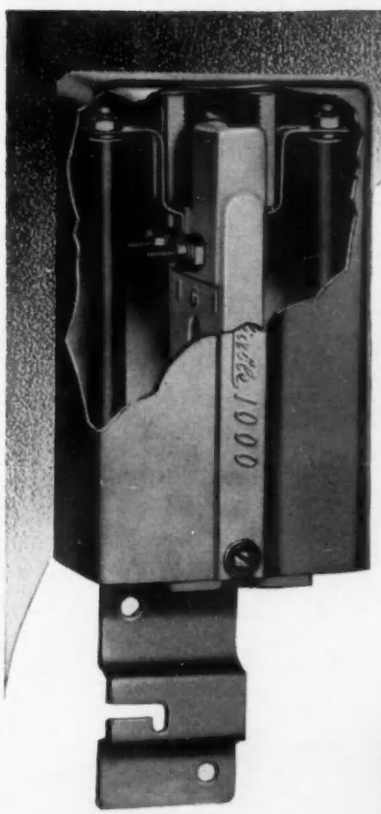
● Some papers have been received without name and address, hence are now held pending word from the owners. Be sure and put your name and address on each set of examination answers submitted.

● New students are being added each month. If you are not taking advantage of this fine training program, why not start now. Remember the first section of the course started in the March 15th issue.

WIRE CHIEF'S EXAMINATION NO. 3

Pole Line Design

1. Why is a knowledge of pole line design computations desirable?
2. What are the three principal factors that must be taken into account in selecting a pole of proper size?
3. What is the purpose of the loading map prepared by the Bureau of Standards?
4. What formula is used to compute bending moment at ground line due to wind pressure on wires?
5. State the formula used in computing bending moment at ground line due to wind pressure on the pole.
6. Why is the safety factor applied to the total computed bending moment that would exist during storm loading conditions?
7. Compute the total bending moment that would exist at the ground line of a 25 pole which carries eight 109 iron wires (in heavy loading area) with the load center about 20 feet from the ground. Spans are 150 feet. The bending moment due to wind pressure on pole may be ignored.
8. The pole line described in Question No. 7 carries rural lines and this gives the line a safety factor classification of 0.33. Apply this safety factor to the computed bending movement obtained in question No. 7 and determine the resistant moment the poles should have.
9. Where there is ten or more wires on a pole line, why is the equivalent wire load used rather than the actual wire load?
10. What are some of the principal items that must be considered in laying out the route of a pole line?



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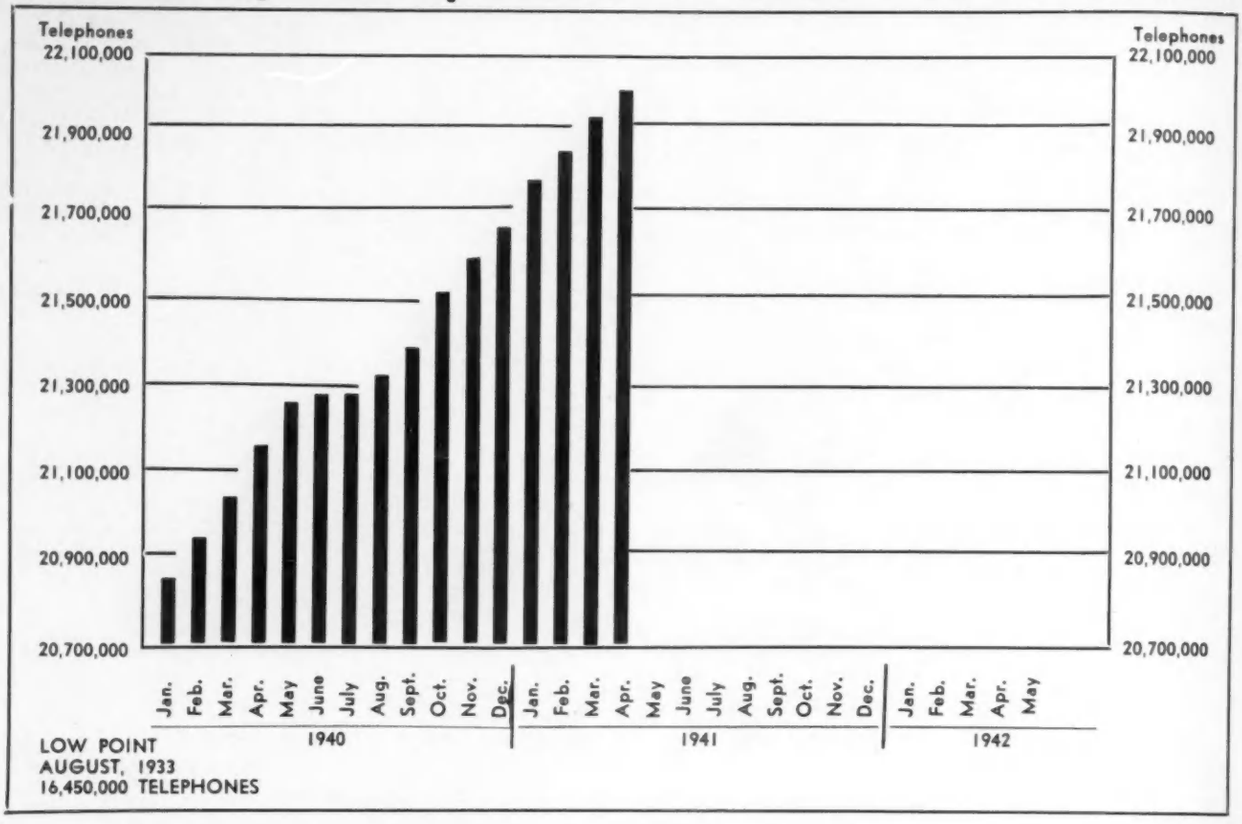

TELEPHONE ENGINEER *Handbook Tables*

by B. C. Burden

File—Testboard Data
Date .....

Subject: *Annealed Copper Wire Table (B & S Gauge)*

GENERAL

Copper wire that is used in telephone cables for line wires, magnet wire, inside telephone wire. and wire used in electrical wiring is generally specified in the B & S wire gauge. This table gives complete data on soft copper wire in all sizes from #0000 to #40. The B & S (Brown and Sharpe) gauge is the same as the AWG (American Wire Gauge).

An increase or decrease of (3) in the B & S wire size increases or reduces the resistance approximately to double or one half the initial value.

ANNEALED COPPER WIRE TABLE (B & S GAUGE)

B & S Gauge	Diameter in mils	Ohms per 1000 feet at 20C (68F)	Feet per ohm at 20 C (68F)	Ft. per lb.
0000	460.0	0.04901	20,400	1.561
000	409.6	0.06180	16,180	1.968
00	364.8	0.07793	12,830	2.482
0	324.9	0.09827	10,180	3.130
1	289.3	0.1239	8070	3.947
2	257.6	0.1563	6400	4.977
3	229.4	0.1970	5075	6.276
4	204.3	0.2485	4025	7.914
5	181.9	0.3133	3192	9.980
6	162.0	0.3951	2531	12.58
7	144.3	0.4982	2007	15.87
8	128.5	0.6282	1592	20.01
9	114.4	0.7921	1262	25.23
10	101.9	0.9989	1001	31.82
11	90.74	1.260	794	40.12
12	80.81	1.588	629.6	50.59
13	71.96	2.003	499.3	63.80
14	64.08	2.525	396.0	80.44
15	57.07	3.184	314.0	101.4
16	50.82	4.016	249.0	127.9
17	45.26	5.064	197.5	161.3
18	40.30	6.385	156.6	203.4
19	35.89	8.051	124.2	256.5
20	31.96	10.15	98.5	323.4
21	28.46	12.80	78.11	407.8
22	25.35	16.14	61.95	514.2
23	22.57	20.36	49.13	648.4
24	20.10	25.67	38.96	817.7
25	17.90	32.37	30.90	1,031.0
26	15.94	40.81	24.50	1,300.0
27	14.20	51.47	19.43	1,639.0
28	12.64	64.90	15.41	2,067.0
29	11.26	81.83	12.22	2,607.0
30	10.03	103.2	9.69	3,287.0
31	8.93	130.1	7.685	4,145.0
32	7.95	164.1	6.095	5,226.0
33	7.08	206.9	4.833	6,590.0
34	6.30	260.9	3.833	8,310.0
35	5.61	329.9	3.040	10,480.0
36	5.00	414.8	2.411	13,210.0
37	4.45	523.1	1.912	16,660.0
38	3.96	659.6	1.516	21,010.0
39	3.53	831.8	1.202	26,500.0
40	3.14	1,049.0	0.9534	33,410.0

Selection and Ordering Of Lead Covered Cable

(Continued from page 29)

indicated the specific methods that must be used.

Single and Double Wrapped And Pulp Insulated Conductors

BECAUSE the insulation resistance between the two wires of the individual cable pair and the mutual capacitance of the individual cable pair are controlling factors in satisfactory transmission, the method of insulating the two conductors of each pair from each other and from the other conductors in the same cable assumes a position of the greatest importance. While the development of the insulation through the years is a story of absorbing interest it is not properly to be included here. Modern telephone cable, except tipping cable and other comparatively short elements of the whole, is insulated between the two conductors of the pair with paper. This paper is applied in the form of narrow tape wrapped around each conductor throughout its entire length, except in the splices, where the utmost care is exercised to preserve the continuity of the insulation by the use of sleeves over the individual wire splices in each conductor. In some cable there is a single wrapping of this paper tape and in others there are two wrappings of paper tape laid on in opposite directions around the conductor. Dry paper is the material used for the insulation of telephone cable conductors because of its comparatively low specific inductive capacity alongside, for instance, rubber insulation which was used in the early telephone cables following the then standard telegraph practice.

The use of one or two wrappings of paper tape controls, to a certain extent, the overall size of the finished cable that having double wrapping being certain to be somewhat larger, for the same electrical characteristics, than the single wrapped. Some veteran cablemen believe, also, that the double wrapped type of cable conductor is more satisfactory when removing moisture from the cable sheath, in repair operations, than the single wrapped. It is the opinion of the author, however, that the type of cable used, whether single or double wrapped, is a matter of cost and overall size and weight rather than anything else, provided that the limitation requirements as to mutual capacitance per average pair per mile, **ohmic loop resistance** of conductor per loop mile and **insulation** are satisfactorily met. It might be assumed that the insulation between the two wires of each pair and between these wires and all other wires in the cable and the sheath would be easily maintained with double wrapped conductors and with greater difficulty in the case of single wrapped conductors. It is a fact of practical importance, however, that single wrapped paper insulated telephone cable is obtainable with an insulation of 500 megohms per mile between the two wires of the pair without any difficulty and that double wrapped cable having the same insulation and with satisfactory mutual capacitance and conductor loop resistance per mile is very little if any to be preferred and is sure to be of somewhat larger diameter and weight per unit of length.

In cable containing small gauge conductors there is also available a type in which the insulation is obtained by wood pulp on the outside of the conductors. This cable permits the inclusion of a very large number of pairs in one sheath, it is somewhat more

THESE MODERN PHILLIPS PLANTS *produce highest quality wires and cables for every telephone use!*

The Phillips' plants, at Brockville and Montreal, are considered among the most modern of their kind in the world. Established in 1889, this organization has pioneered many important improvements in wire drawing and fabrication, and its products have the benefit of a half century's experience in meeting the exacting needs of the communication and electrical industries.

Every type of electrical conductor used in telephone work is produced by Phillips in its own plants and under its own control from copper bar to finished wire. When you buy Phillips wires and cables, you are assured of getting only the finest, high quality products which will save you money in better performance and long, trouble-free life. Write for latest prices.

PHILLIPS

Wires, Cables and Telephone Products

Distributed by:
CANADIAN TELEPHONES & SUPPLIES LIMITED, TORONTO
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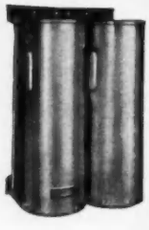
AUTOMATIC ELECTRIC SALES COMPANY, LIMITED, CHICAGO

Build Goodwill and Revenue WITH THIS SMALL P·A·B·X



Key type telephones, such as the one shown above, plus this compact switching unit, provide automatic intercommunication combined with fast trunk service at low cost.

This system — the 32A — serves up to six stations and is just the thing for residences and small offices where an attended system is impractical.

EARNINGS TOO LOW?

Try the 32-A. Its high service value commands a high rate, and its extra earning power will help to bring your percentage of net income to a more satisfactory level.

Distributors in U. S. and Possessions:
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AUTOMATIC ELECTRIC

TELEPHONE, SIGNALING, AND COMMUNICATION APPARATUS

easily handled in splicing and can be obtained in smaller conductor guages to meet the proper electrical requirements of telephone transmission in cable construction.

Terminating Cable

WHENEVER paper or wood pulp insulated telephone cable is to be terminated it must be protected by some kind of hermetical sealing against the destructive elements in the air. The author has seen, in old fashioned telephone offices, paper insulated cable conductors terminated directly on the terminals of the Main Distributing Frame. In such cases the conductors were formed out and laced, the wire conductors brought through the blocks and soldered to the terminal lugs and the whole was then treated to a heavy coating of shellac. Such methods cannot be used now for a number of reasons and it is the present standard practice to splice the paper insulated cable to a short length of tipping cable, in which the conductors are insulated by some form of textile, (the old timer's name for this kind of cable was "Wool Cable"), which is then formed out and laced the conductors being brought through the terminal blocks and soldered to the terminal lugs. In some cases a pot head is used but in any event whether textile cable or pothead is used the length from the paper insulated cable to the terminal lug should be made as short as possible. Of course the gauge of the conductors in the textile cable or in the pot head should be the same as the gauge of the conductors in the paper insulated cable for which it forms the terminating member.

When paper insulated cable is to be terminated in a distributing or terminating terminal it is done by the use of a custom made cable tail in the terminal or by the use of a pothead. There are a variety of methods used by different authorities for terminating paper insulated cable. The selection of the method and the ordering of the required terminating material is simple and easily done when it is remembered that paper insulation is highly absorbent and must be hermetically sealed, by some effective method, against the entry of moisture.

Selection and Ordering of Accessories

THE selection of the cable to be used is subject, finally, to the careful consideration of the type of construction proposed and the other elements that affect the total cost of the project. For illustration suppose that double wrapped cable is, for some reason, definitely decided upon. In certain sizes of cable and gauges of conductor the use of double wrapped conductor insulation in preference to single wrapped may call for some consideration of the strength of the messenger to be provided, the condition of the poles (if the cable is to be aerial), the weight and hence the freight and cost of hauling and the labor of stringing. The point is that insofar as the proper scope of this outline is concerned neither single wrapped, double wrapped nor wood pulp insulation cable can be assumed to be the best. The telephone executive, however, must take into consideration all the elements of the proposed cable installation because after the electrical characteristics of the cable have been assured the factors affecting cost and time required must be given consideration also. While this discussion is confined to the selection and ordering of lead covered cable the finished project involving the cable in the telephone plant is affected in many ways which are not directly related to the electrical qualities of cable alone.

Kind of Sheath

IT is practically standard practice to order lead covered cable with a sheath composed of an alloy of lead and about one per cent a Antimony. Sheaths of pure lead are usually specified in the case of cable to be used inside buildings. Cable with a sheath composed of an alloy of lead with about three per cent of tin can also be secured but it is the opinion of the author that the standard lead antimony alloy sheath is the most satisfactory when all things such as time of delivery, cost and durability are considered. The pure lead sheath in the case of cable to be used inside buildings is probably more nearly the standard practice for that kind of service because of somewhat greater flexibility and the probable necessity of making rather short turns in its installation.

In case of the existence of conditions which interject unknown factors, when it is desirable to include long distance circuits in the cable when job lots of cable are offered at attractive prices or when any detail of the problem is not clearly understood then the advice to the small telephone company is to seek competent help and advice. This is because your cable will cost a lot of money, it will be rightfully expected to give service a long time and it must be properly designed or disappointment may be the result. In projects of this sort the manufacturers will be found to be not only willing but even anxious to render every kind of assistance that lies within their power.

—END—

Fluorescent Lighting for Telephone Offices

(Continued from page 24)

lags further behind the voltage in one lamp than in the other and this effect is obtained by a split phase circuit similar to that used in connection with small A.C. motors. With a properly designed two lamp unit the flicker is quite low and not at all objectionable. Fig. 4 shows the circuit of a two lamp unit.

Flourescent lamps are rated at 2500 hours average life. The ordinary best grade Mazda lamps are rated at only 1000 hours. It is thought, however, that fluorescent lamps will give a more uniform light over their rated life than will the incandescent type lamp.

Flicker Rating of Fluorescent Lamps

A table prepared by the General Electric Company is very interesting in showing the relative flicker effects of various types of combinations of fluorescent lamps as well as ordinary filament lamps. The ratings given are in terms of percent deviation from mean light output. It will be noted that the 100 watt filament type lamp has only 5% deviation whereas the blue fluorescent has 90% variation. (Operation on 60 cycle circuits)

Operating on Direct Current

Fluorescent lamps are designed primarily for A.C. operation, however, may be used under certain circumstances on D.C. circuit When so used, it is necessary to have special reactors and series resistances in order to provide the necessary starting voltage and current limiting conditions.

Radio Interference from Fluorescent Lamps

Ordinarily very little radio interference is picked up from a fluorescent lamp provided the radio is 9 feet or more away from the lamp. In some cases, however, some R.F. radiation may take place through the electrical supply line and will require correction by means of condensers shunted to ground from one side of the line at the offending light fixture.

Initial Lumen Output for All Colors

FLUORESCENT lamps are available in what is known as daylight, white, blue, green, pink, gold and red. The day light lamp should be used wherever correct color rendition is a factor. Where a maximum quantity of white light is desired the white lamp should be used. For decorative purposes or window display any of the colored lamps will serve nicely, however, the maximum amount of colored light will be obtained from the green lamp. The following table shows the comparative light output for

Daylight	55
White	25
Daylight (Tulamp type)	25
White (Tulamp type)	16
Blue	90
Gold	25
Green	20
Pink	20
Red	10
40 Watt filament lamp	13

Table No. I—Percent deviation from mean light output. (Approx.)

Put Them in Service Again . . .

Use Suttle B-1 Receiver Re-manufacturing

While doing your spring clean up, get together all those old junk receivers that have been laying around idle, and put them into service where they can be of real benefit to you.

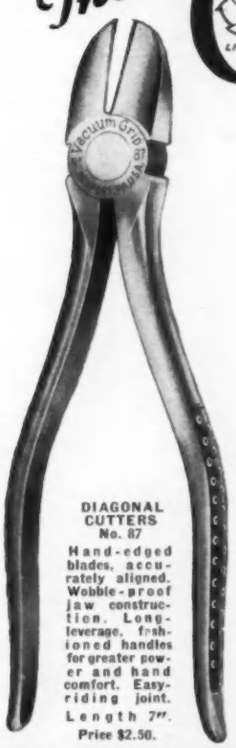
Suttle B-1 Receiver Re-manufacturing service includes complete renewal of the core, supplying new shells, new cords, and new diaphragms.

Receivers are accurately checked for final test as to resistance and efficient performance and are returned to you looking and performing like brand new ones, in individual cartons for easy stocking.

See Catalog for Details

Suttle Equipment Co.
LAWRENCEVILLE, ILLINOIS

Their OK *is a safe guide for You*



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Length 7".
Price $2.50.

WHEN you receive enthusiastic reports on a tool from the men who use it daily, you can be sure that its purchase is a safe investment.

Veteran linemen and electricians who have used this famous Vacuum Grip pattern for years praise it in the highest terms. They appreciate the fine craftsmanship that has imparted to it many features for speeding up their work — and making it easier.

These men will also tell you that No. 87 is a "diagonal" they can really depend on for years of outstanding service. Durability means Economy, the one feature that's of special interest to every pliers buyer.

Our 30-Day Trial Offer enables you to make running tests at our risk. Write today for full particulars.

Vacuum Grip Pliers
OVER A MILLION AND A QUARTER IN USE

Made by the FORGED STEEL PRODUCTS CO. Newport, Pa. — and made RIGHT!

"No trouble to see why the boss specifies Chance Expanding Anchors

90°

There's a lot of reasons . . ."

• Equal power distribution

Blades expand in opposite directions equalizing strain.

• Extra area in solid earth

Expands to more than two and a half times its size.

• No disconnecting arms

Steel clamps prevent arms from jumping off.

• No breakage

Drop forged steel driving head withstands heavy impact. Heavy ribbed blades stand excessive strain. All steel.

• Destructible nut retainer

Aids installation—Prevents riding up the rod. Permits salvaging rod or driving rod in ground to abandon it.

• Easy expansion

Sharp blades cut quickly. Ribbed blades and base plates keep alignment.

• Metal record tags

Records type and size installed.

A·B·CHANCE CO. CENTRALIA MISSOURI

Color	18"	24"	36"	48"
Daylight	450	660	1110	1600
White	555	820	1380	2000
Blue	315	460	780	....
Green	900	1300	2250	....
Pink	300	440	750	....
Gold	375	540	930	....
Red	45	60	120	....

Table No. 2—Ouput in Lumens for Flourescent Lamps

the various sizes and types of lights. (See table No. 2)

Fluorescent Light Equipment

For those that desire to build up their own fluorescent fixtures for experimental circuits, the following equipment is required for each single lamp unit. Two lamp holder sockets, one of which should be a combination lamp holder and starter socket, one ballast coil, one starter. It should be noted that the lamp holders are the same for the 18, 24, 36, 48 inch sizes, however, a different type of ballast is required for the different wattage lamps. The standard socket for use with Fluorescent lamps is shown in Fig. 5.

Fig. 6—Ballast (reactor) coil.

The condensers used for power factor correction for single lamps have capacities ranging from 5.0 m.f. to 11 m.f. for lamps whose ratings range from 15 to 40 watts. These are ordinary paper insulated condensers. The ballast coils vary in size depending on the wattage of the lamp with which they are used. A typical ballast unit is shown in Fig. 7.

The efficient neon starter unit illustrated in Fig. 8 plugs into the socket shown in Fig. 5.

—END—

OBITUARIES

Merle D. Southworth, vice president of the Pennsylvania Telephone Corporation, Erie, Pa., died in the Johns-Hopkins hospital at Baltimore, Md., Sunday, April 13, following an operation.

According to members of the family, Mr. Southworth had gone to the John Hopkins hospital one week ago for observation. It was decided by examining physicians that an operation would be necessary to remedy the condition and preparations were made.

Mr. Southworth had been elevated to the vice-presidency of the telephone company on January 1, 1940, succeeding Harry Engh, who was made president of the corporation. Mr. Southworth had also continued his duties as general plant superintendent since his new appointment.

Survivors are his widow; one son, Walter; and one daughter, Mrs. Philip Skovron.

Clyde F. Sauers, 50, for ten years manager of the Ringsted (Iowa) Telephone Company, died early in April of a heart attack. Mr. Sauers death was sudden, following a normal workday. Survivors are his widow, son and daughter.

James A. Sullivan, 71, for eighteen years general manager of the Lexington (Kentucky) Telephone Company, died in the St. Joseph's hospital at Lexington, Friday, April 18, a few hours after being admitted.

He had been in the telephone business for fifty-three years. For thirty-five years he was connected with the Southern Bell Telephone & Telegraph Company.

Surviving are a daughter, Mrs. James F. Pennington; two sons, James A. Jr., and Parker Sullivan.

Mrs. Bessie Goslee, 51, for twenty years night operator at the Versailles Telephone Exchange, Versailles, Ohio, died at her home, Saturday, April 5. Her death was attributed to a complication of diseases.

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Only ONE Contact!

Price $44.00

F. O. B. factory

For better and cheaper ringing

No Radio Interference

30-day free trial

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LENZ ELECTRIC MANUFACTURING COMPANY

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"IN BUSINESS SINCE 1904"

YOU'LL FIND THE BATTERY CHARGER YOU NEED IN THE

GENERAL ELECTRIC LINE

ALL over the country General Electric Copper Oxide and Tungar Chargers are keeping telephone common battery systems in tip-top operating shape. The model illustrated here is used by many telephone companies. If this isn't the model you need, tell us about it. We have one for you.

Section A155—Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

6RB6B17 Tungar Battery Charger With Filter Reactance—This 12-amp. full-wave Tungar is excellent for float-charging telephone batteries. It offers a wide charging range (6 to 65 volts, 2 to 12 amperes) and highly efficient operation. External filter reactance available.

SANDS

TYPE 60

CABLE TERMINAL

For a permanent, workmanlike job on your next cable installation, try SANDS Type 60 terminals. Bring the cable in from top or bottom—and see how snug, how smooth, all those connections are. You'll know you've done a craftsmanlike job.

It takes good products to do a good job—and SANDS cable terminals are really good.

TYPE 60 SPECIFICATIONS

With or without 6 ft. 22 gauge cable stub. All metal cover. Reversible. Capacities: 11, 16, or 26 pair.

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Highlights of the Communication News

(Continued from page 20)

pected speed" the report cited that in one telephone switchboard building they repaired 70,000 cable pairs on the main frame in two weeks despite the fact that the telephone workers had to get to them through debris, sewage, water and gas fumes and most of the time wore gas masks. The British have found the quickest way to repair cables struck by bombs is to by-pass the crater and not work in it. When telephone exchanges are put out of action the British establish a special telephone bureau and the experience has been that facilities should be dispersed and the air raid defense officials must not be dependent upon one telephone station. The second and third floors of buildings are safest for switchboards.

Telegraph Merger Plan

THE telegraph merger plan which has been advocated in Washington for many years was slated to come up for another scrutiny by Congress May 19 when the Senate Interstate Commerce Committee commences hearings on the government proposals for a Western Union-Postal Telegraph consolidation. The FCC is advocating the amendment of the Communications Act to grant the telegraph industry, both domestic and the international cables and radiotelegraphs, permissive legislative authority so that they can merge just as is allowed in the telephone field. FCC Chairman James Lawrence Fly is to be the principal government spokesman, while Major General Joseph O. Mauborgne, Chief Signal Officer of the Army and, Rear Admiral Leigh Noyes, Director of Naval Communications, present their views on any telegraph merger plans in its effect on national defense communications. The labor unions, both the CIO's American Communications Association and the AFL Commercial Telegraphers Union, do not look too kindly upon the merger scheme and the National Federation of Telephone Workers is opposed to any plan to transplant the teletypewriter exchange service from the A. T. & T. and Bell System into a new telegraph merged company. Both Western Union and Postal Telegraph were slated to advocate Congressional enactment of permissive merger legislation.

FCC Concludes Public Hearings on Keystone Acquisition Plan

THE FCC's hearings in Philadelphia on the first step to consolidate the Keystone Telephone System in that city

(Turn page please)

25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of MAY, 1916

Five thousand five hundred telephone men gathered in New York, Philadelphia and Baltimore on Friday night, May 19, 1916, at dinners, the feature of which was the use of the transcontinental telephone line bringing together the diners of the three cities.

▼

A new type of push button was placed upon the market, twenty-five years ago, by the Connecticut Telephone & Electric Company of Meriden, Conn. This button fitted with a long self-cleaning contact spring was the only push button upon the market with a double rubbing contact.

▼

To facilitate the operation of elevators in office buildings, an elevator telephone system was designed in 1916 by the Northern Electric Company. This apparatus was used for providing means of instant communication between the elevator dispatcher and the car operators.

▼

The Executive Conference of the United States Independent Telephone Association was held at the Hotel LaSalle, Chicago, on April 22, 1916. Those members of the board present were: A. F. Adams, Terry W. Allen, F. L. Beam, A. G. Bean, W. H. Bryant, P. C. Burns, J. C. Casler, H. D. Critchfield, J. B. Earle, E. B. Fisher, Hunter L. Gary, W. F. Goodrich, F. B. MacKinnon, W. Roy McCanne, C. Y. McVey, Albert Parlett, H. Linton Reber, G. W. Robinson, E. D. Schade, W. J. Uhl, W. S. Vivian and F. H. Woods.

▼

Eight thousand copies of the April, 1916 issue of the Missouri and Kansas Telephone Company's directory was issued. Representatives of the various mutual telephone companies in Kansas and Missouri formed a mutual telephone association for the safeguarding of the mutual telephone companies.

and in Southern New Jersey with the Bell System—the application of the New Jersey Bell to acquire the capital stock of the Imperial Securities Co. which controls Keystone—concluded the Commission's public inquiry into this plan which would eliminate the last major situation of duplicate competitive telephone service in the same territory.

The New Jersey Bell and the Bell Telephone Co. of Pennsylvania have informed the FCC that they will bear proportionately the costs of the acquisition of the Keystone System and that all Keystone employees will be retained on the same status as if their service had been with the Bell System and their pension rights will be fully protected. One big stumbling block against the proposed termination of the Keystone System—the lower Keystone rates and facilities for large business establishments in Philadelphia—appeared to be near settlement as the Bell of Pa. has offered to purchase the PBX and other telephone equipment owned by large business firms in connection with their Keystone service. In the hearings held during the first two weeks in May in Philadelphia, the FCC centered considerable attention on the financial transactions between the New Jersey Bell and the Imperial Securities Co., the latter being a subsidiary of the Theodore Gary & Co.

Oregon Convention City Changed

A last minute announcement informs us that the Oregon Independent Telephone Association has changed its meeting place from Redmond to the Portland Hotel, Portland on June 16th.

States L. A. Gritten, Sec.-Treas. "It became evident that owing to the present business situation and certain difficulties in making connections that it would be better to change our convention from Redmond to Portland."

John Jensen Named as Plant Superintendent

John Jensen of Southern Pines, N. C., has been named to succeed George Thompson as plant superintendent for the Arkansas Associated and Central Missouri Telephone companies, George A. Hearne, general manager, announced. He will be located in Warrensburg.

Mr. Jensen has been employed by the eastern unit of the system for the past two years. Prior to that Mr. Jensen spent fifteen years as general plant superintendent for the Central Iowa Telephone company with headquarters at Tama, Ia.

Mr. Thompson has been transferred to Southern Pines, N. C.

Exchange Damaged by Fire

A fire of unknown origin destroyed the roof of the Cordova (Ill.) Telephone Exchange March 29. The fire was discovered by Maynard Allen, manager of the telephone company, who sent out a call for aid. Friends and neighbors responded and a bucket brigade was formed to bring water to those fighting the fire.

It is believed the loss was entirely covered by insure.

Improvements

Condensers are now being placed in the 500 phones of the Shell Rock (Ia.) telephone exchange as a preliminary to installing a new automatic-ringing switchboard in April. The change will cost more than $3,000.

Phone Company Sold

The Somerton Telephone Co. (Ohio), owned by McKeen's was sold this week to Garfield Burcher. Mr. Burcher moved into the property formerly owned by Ada Strahl and will operate the office in the home.

A FAVORITE FOR 20 YEARS

UNIQUE SPLICERS FURNACE

Melts 50 Lbs. of Solder in 10 Minutes

A high-quality production tool with many outstanding features, including:

- **FINE FLAME CONTROL**—keeps solder at "just the right temperature."
- **"QUICK CHANGE" GENERATOR**—removed and replaced in 60 seconds.
- **WIND-PROOF**—housing shields generator—No extra shield is needed.

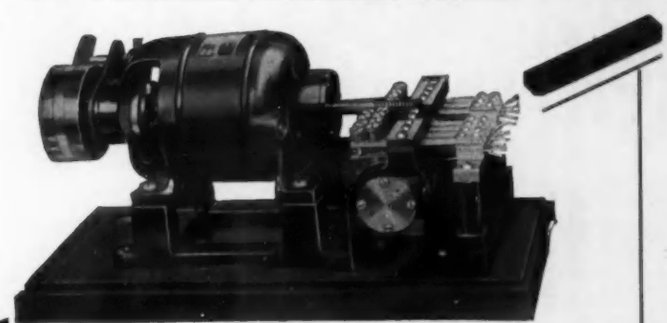
Additional Features: Long-life figure "8" generator—with orifice scraper. Rugged semi-steel top plate. Powerful pump. 16 gauge welded steel tank with bottom shock ring. Size 8" x 13". Weight—15 lbs. Popular size for 6", 7", and 8" pots.

No. 55-I—KEROSENE No. 53-I—GASOLINE

ORDER THE KEROSENE FURNACE if clear white gasoline is hard to get.

Write For An Approval Test—and NEW BULLETIN "40" giving full information.

UNIQUE MANUFACTURING CO., INC.
221 W. Walton St. — Chicago, Ill.



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MOTOR-DRIVEN
INTERRUPTER

Holtzer-Cabot complete motor driven interrupter equipment combines a method of producing good signaling tones with a means for automatic ringing. Holtzer-Cabot interrupter equipment will:

1. Eliminate slow acting relays.
2. Reduce maintenance.
3. Give positive timing.

AND

4. Is SIMPLE AND DEPENDABLE.

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MAKE TELEPHONING *CONVENIENT* with GRAY *Pay Stations*

No. 20

A well located pay station encourages telephone usage and brings in extra profit.

The No. 20 is ideally suited to locations where space is limited and a simple, economical station is desired. It mounts on a shelf or counter and is furnished with a shelf mounting bracket and arms for attaching a desk stand of any desired type. No electrical connections are required.

For further information see one of our agents listed below.

AUTHORIZED AGENTS:
American Automatic Electric Sales Co.
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Leich Sales Corporation
The North Electric Mfg. Company
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IN CANADA:
Canadian Telephones & Supplies, Limited
Northern Electric Co., Limited

the **GRAY MFG. CO.**

Off THE ASSEMBLY LINE

Morton's new Strowger Automatic equipment, showing line switches, selectors, and connectors.

MORTON, ILL. GOES TO STROWGER AUTOMATIC

AT Morton, Illinois, the opening of a new Strowger Automatic (step-by-step) telephone system on March 29, commemorated almost to the day, the fiftieth anniversary of the granting of patents to Almon B. Strowger, in 1891, for the first automatic telephone exchange.

Morton is one of the fifteen exchanges operated by the Illinois Valley Telephone Company, and is the third to be converted to automatic service. The cutover operations took place in the new, modern exchange building, especially built to house the new equipment.

The Strowger Automatic equipment was engineered and built by Automatic Electric Company, Chicago, and has a capacity of 450 lines, utilizing Strowger line finders, selectors, and connectors mounted on single-sided frames. Harmonic converters provide full-selective ringing on party lines. The installation includes also a new one-position toll board.

Promptly at midnight, as a feature of the ceremony, Mr. S. B. Green of Streator, general superintendent of the Illinois Valley Telephone Company, gave the signal. As Mr. Green spoke, Mayor Philip C. Hauter of Morton, sitting at an operator's desk, dialed a number and officially started the service. A call was then placed through the toll board to Mr. V. E. Chaney, Fort Wayne, Ind., president of the Illinois Company. A conversation ensued, in which general introductions and congratulations were exchanged.

During the forty-eight hours following Saturday midnight, a total of 9,824 completed local calls were recorded on the traffic meters connected with the equipment, or an average of 4,912 per day for the two days (one of which was Sunday) which compares to the usual week-day average of 2,687 calls under the former manual system. This increased traffic was as usual due partly to the novelty offered by the new common battery Monophones with which the old magneto instruments were replaced.

Among those who attended the cutover were T. A. Saunders, general superintendent, and W. P. Stokesbery, plant superintendent of the Illinois Central Telephone Company; R. N. Cole, commercial manager, R. B. Still, general manager; and O. R. Roach, engineer of the Wabash Telephone Company; and A. L. Pritcher, commer-

New modern home of the Morton exchange.

cial representative at Morton. Carl J. Pracht, Chicago, represented Automatic Electric Company.

Kellogg Production and Labor Stabilized

The Kellogg Switchboard and Supply Company has announced that an important step has been made toward the assurance of maintaining production and deliveries with an agreement having been reached on all labor questions.

The company is providing workers with a wage increase and vacations with pay and thus is rounding out a program designed to enhance employee relations and assure efficient plant operations.

The Kellogg Company maintains an "open shop" and although some employees are members of various trade unions they share equally in personnel benefits. Last year the company made it possible for employees to take advantage of a hospitalization plan. On January 9 Mr. M. K. McGrath, President, announced that all Kellogg employees called for duty under the Selective Service Act, who have been with the company for one year or more, would be paid half the difference between their regular wages and army pay for a period of 13 weeks. Drafted workers were promised re-employment upon leaving military service.

For 30 years there has been a Kellogg Employee's Thrift Club in operation. Funds created from this are available for employee borrowing at reasonable interest rates. Dividends to the employee on savings amount to about 7%.

On the basis of individual earnings and length of service with the Company, each employee thruout factory, office and field received a special bonus last December.

Visualizing the demands on its factory production by the National Defense Program and also that telephone companies must be taken care of because of their importance in furnishing adequate communication facilities to keep step with increasing activity throughout the country, Kellogg has laid plans for increasing its capacity output. New machines have been installed and hundreds of new employees have been added to the payrolls. Part of the plant is already on a 2- and 3-shift schedule and other departments may soon be working 24 hours.

$11.00 Per Telephone Taxes for 1940

The taxes of the A. T. & T. and Bell System in 1940 equalled about $11 per telephone or nearly a dollar a month for each station, the annual report showed.

While it was noted that the Bell System earnings were not sufficient to subject the System to any excess profits tax, the 1940 burden of taxation was larger than in recent previous years. The 1940 taxes, including those charged to construction, amounted to $187,598,000, an increase of $28,693,000 over 1939 which in turn had been $11,474,000 higher than in 1938.

Increases Wages

All hourly employees of the Cook Electric Co., Chicago, enjoyed a 10% wage increase effective May 5. This an-

SUB-CYCLE
The MODERN Method of Ringing
•
No Moving Parts
Nothing to Adjust
Economical Operation
Quiet
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BETTER RINGING SERVICE
Six Models for Loads Ranging from the Small PBX to the Large Central Office.
Prices $32.00 to $93.50
Also Pulsators
Write for Literature
Lorain Products Corporation
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CREOSOTED PINE POLES

The T-C COMPANY
You can buy T-C poles with complete confidence because they are made by a seasoned, energetic and able organization working with the finest pole-producing facilities.
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BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.), AND SAN FRANCISCO

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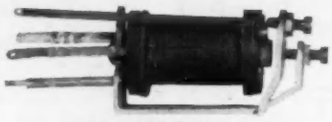
W. E. CO.
LINE RELAYS



No. 189-D type

Mtgs. for above relays
711-A for 20 relays
717-A for 25 relays
706-B for 30 relays

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Buckeye Telephone & Supply Company
COLUMBUS, OHIO

QUALITY CORDS

WHEN YOU NEED CORDS BUY QUALITY CORDS

Commercial cords are high quality cords, because they are made using the best materials and with expert workmanship.

Our standard are now waterproofed and moisture-proofed with no increase of prices.

"QUALITY CORDS"

Commercial Cord
AND SUPPLY COMPANY
CLIFTON SPRINGS, N. Y.

nouncement was made last week by W. C. Hasselhorn, President.

The Cook Electric Company personnel has benefited for some time from the following company policies: Vacations with pay; group life insurance; wage incentive payments for production is excess of standard output; hospitalization and medical service; annual bonus; observance of Walsh Healy Act; modern, well-lighted working conditions and planned recreational activities.

Robert T. Bowman

Roebling's Robert T. Bowman

Appointment of Robert T. Bowman, of Trenton, New Jersey, as Director of Public Relations for the John A. Roebling's Sons Co., with plants at Trenton and Roebling, New Jersey, and branch offices in thirteen cities, was announced at Trenton today by Charles G. Williams, Executive Vice President and General Manager of the Roebling Company.

Bowman assumed his new post on May 1st. He served three years as President of the New Jersey State Chamber of Commerce and retired from that position last week.

THE NEW ELECTROX
Battery Eliminator Type PA-05004

$16.85

Complete with power-off relay. Output for two operators' sets. Mount; connect two leads to operator's terminal; plug in cord. Presto! no more battery problem! Sent on trial. Write for Cir. 373.

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A Schauer Product CINCINNATI, OHIO

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J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
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CONSULTING ENGINEER
Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
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Carney
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis

Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

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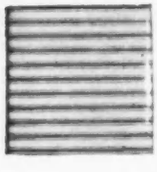
Formed-flexible finishing cloths (Patented); Flat finishing cloths; Catch cloths; Crotch cloths and Up-right joint catch cloths. Made of world-prize HERRINGBONE TICKING or imported English MOLESKIN. Write for literature and prices from your jobber or from us.



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3035 ALDRICH AVENUE, MINNEAPOLIS, MINN.

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ADVERTISING
Write or telephone for proposition
L.M.BERRY & CO.
Call L.D. 16, Telephone Bldg., Dayton, O.

The Clearing House

For the convenience of readers of Telephone Engineer

Reconstructed Equipment

North Elec. ALL RELAY AUTO. Swbd. Fully equipped with 60 lines and 6 links complete with Dry Disk Charger. Meters and straight line ringing machine. Operates off 48 volt Bt. Ckt. less Batts. Price on application.

Western Elec. No. 2C drops and jacks 5 per strip @ ..... $ 7.50

Kellogg No. 301, 500 ohm drops and jacks 10 per strip @ 16.00

Stromberg Carlson No. 11 350 or 500 ohm drops and jacks 5 per strip @ 7.50

Western Elec. 3 Cell Battery boxes Metal @ ..... .55

Kellogg No. 2800 4-bar 1000-1600 or 2500 ohm ringer compacts @ 9.25

Kellogg No. 118 Desk sets with New Cabinet inside connection 3-bar 1000-1600 or 2500 ohm ringer signal set @ $9.75—4-bar $10.50—5-bar @ 11.25

Western Elec. No. 20AL desk set with New Cabinet inside connection 3-bar 1000-1600 or 2500 ohm ringer signal set @ $10.00—4-bar $10.75—5-bar @ 11.50

Automatic Elec. No. 34A3 Monophones with No. 24 Dial and straight line Ringer and Anti Side Tone Talking Ckt. @ 15.00

Automatic Elec. No. 426 Desk set with dial Trans. & Rec. Complete with enclosed gong straight line signal sets with Anti Side Tone Ckt. @ 12.00

Kellogg 4-bar Generators with Crank and Mtg. Screws @ 3.00

W. E. No. 16 Ind. Coils 50c ea. No. 20 @ .35

W. E. No. 21D or 21W Condensers @ .... .35

REBUILT ELECTRIC EQUIPMENT CO.

1934 WEST 21st STREET

Pilsen Station

CHICAGO, ILL.

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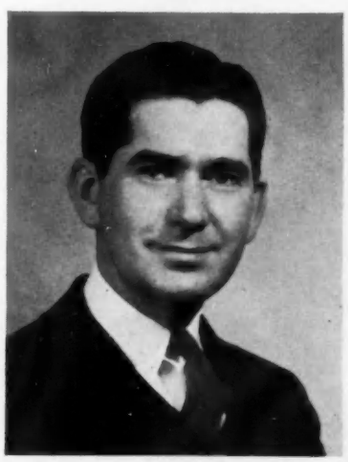
Sag Slide Rule Available

To assist the users of its new high strength telephone line wire the **Indiana Steel and Wire Company** of Muncie, Indiana, have made available to operating telephone companies a neat and convenient slide rule which shows the sag which should be given various span lengths at different stringing temperatures for both the HTL 85 and the HTL 135 wire. To utilize the new slide rule merely move the slide so that the stringing temperature appears beneath a small window. The sag in inches can then be read directly opposite the desired span length. The rule covers heavy, medium, and light loading areas and will prove indespensable to those companies who are taking advantage of the economy offered in the new high strength wire. This rule is available to operating companies by writing to the above company.

New Kellogg Representative



Ernest Wommack, formerly associated with the DeQueen Telephone Co., DeQueen, Ark., is now representing the Kellogg Switchboard and Supply Company in the southern half of the state of Texas. Jim Lindsey, who until now covered the whole state, will confine his travels to the northern half.

By dividing the state in this manner, the two men can give more attention and better service to Texas telephone folks than was previously possible.

Ernest is a dyed-in-the-wool, experienced telephone man. Ever since he left Arkansas University he has been associated with the DeQueen Telephone Company of DeQueen, Arkansas. He started as plant superintendent and later became manager.

ENGINEER WANTED

Leading manufacturing and sales company require services of telephone engineer with comprehensive experience for sales work in export field. Must be U. S. citizen, not over 30 years old. Box 8265, TELEPHONE ENGINEER.

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Specialists in Repairing and Rebuilding Transmitters

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OUTSIDE IRON POLICE BOXES —with Kellogg C.B. Straight Line Telephone.....Complete—$14.00

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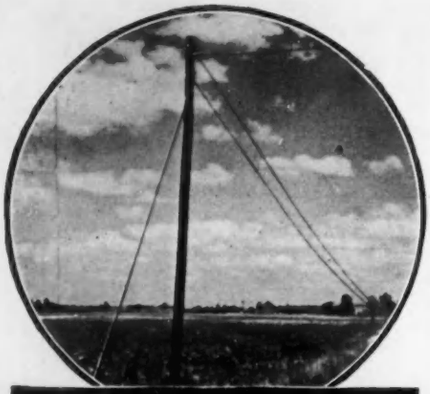
All the Buddy Poppies are made by disabled and needy ex-service men patients in government hospitals and are guaranteed by a copyrighted green label.

The entire proceeds of the Sale are used for relief activities among veterans and their families, including an allotment to the V.F.W. National Home for Widows and Orphans of Ex-Service Men in Eaton Rapids, Michigan.



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HIGH-TENSILE
LOW-RESISTANCE
LINE WIRE

MEET RURAL DEMANDS WITH LONGER SPANS!

You now can extend rural telephone service more economically, more profitably, by building long-span lines with *Crapo* HTL-85 and *Crapo* HTL-135 High-strength Line Wire.

Marked reductions in construction costs, lower maintenance expense, improved transmission, are reported wherever these high-tensile, low-resistance line wires are in use.

Crapo HTL-85 permits spans of 225 feet in heavy loading, 325 feet in medium loading and 375 feet in light loading districts; provides stronger spans on existing lines.

Crapo HTL-135 makes practicable spans of 350 feet in heavy loading, 450 feet in medium loading and 500 feet in light loading areas.

Before you construct new rural lines or rebuild old ones, be sure to get all the facts about these revolutionary wires! Complete technical and construction practice information, available in booklet form. Write for Bulletins No. 201 and No. 202!

INDIANA STEEL & WIRE CO.,
MUNCIE, - - INDIANA

Manufacturers of

Crapo Galvanized Steel Strand, Telephone and Telegraph Wire, Construction Wire and Tie Wire.

For Long Spans

For Extra Long Spans

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